A PRELIMINARY STUDY

OF

THE GREAT GRAY OWL (*Scotiaptex nebulosa nebulosa*) (Forster)

IN ALBERTA

WITH OBSERVATIONS ON SOME OTHER SPECIES OF OWLS

by

Albert F. Oeming

THE UNIVERSITY OF ALBERTA

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A DISSERTATION

SUBMITTED TO THE SCHOOL OF GRADUATE STUDIES

IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE DEGREE

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by

Albert Frederick Oeming, B.Sc.

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ABSTRACT

A paucity of scientific information concerning this continent's largest owl, the Great Gray, and the known scarcity of this species in Alberta prompted this investigation.

Two nests of this rare species were discovered during the course of the study, one in the Edson area, the other in the Rocky Mountain House region. This, together with fourteen dead specimens and eight live Great Gray Owls encountered in the course of this investigation, made possible a study of this species with regard to the following: identification, classification, plumages, sub-species, pterylography, molt, eye-color, anatomy, distribution and movements, courtship, nesting, reactions to intruders, voice, activities of adult owls, description of young, physical development of young, food habits, enemies, parasites and diseases, and economic status.

No less than eleven new records for the Barred Owl emerged in the course of this investigation. These findings revealed a hitherto unsuspected, established population in Alberta.

Thirty-five Snowy Owls captured during the winters of 1953-54 and 1954-55 for banding purposes were used for a weight and plumage color study which proved

conclusive in sex determinations. An extremely interesting banding recovery was also recorded.

Observations were made on the distribution and feeding habits of the ubiquitous Great Horned Owl. Since the spring of 1951 an effort has been made to gather data on the little known northern forest owls of the province. Notes were made on the occurrences and food habits of the Hawk Owl, Saw-whet and Richardson's Owl, to supplement information already known about the birds.

The first Screech Owl captured in Alberta was taken in the Swan Hills. A second specimen from Lesser Slave Lake was forwarded to Dr. Wm. Rowan of the Zoology Department of the University of Alberta.

Although much remains to be learned about the Great Gray Owl and the other northern forest owls of Alberta, it is felt that this preliminary study has laid the ground work for more extensive investigations in the future.

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INTRODUCTION

The first notes and photographs on the nesting of the Great Gray Owl in Alberta were taken by A.D. Henderson of Belvedere, Alberta in 1915. Never really common then, these owls have now almost vanished.

Few of America's experienced ornithologists have seen the Great Gray Owl in life and there has always been a dearth of material in collections. Shortly after 1930, Red Squirrel pelts in Alberta began to acquire some commercial value. Hundreds of trappers then invaded the great spruce forests and at the same time declared war on all owls. Most trappers are imbued with a universal prejudice against owls, feeling that the birds prey heavily on marketable fur-bearing animals and so seriously reduce the trapper's potential profit.

The Great Gray Owl was condemned along with other species of owls and not having the wary and suspicious nature of some of these it offered an easy target for the trappers' guns. The decline in numbers of Great Gray Owls was rapid, and in less than ten years after the price increase for squirrel pelts, the birds became exceedingly rare in Alberta.

In December of 1951 I collected my first Great Gray Owl in dense muskeg country west of Fawcett, Alberta.

Veteran oologist A.D. Henderson was consulted on suitable nesting areas of this species. He felt there was still a chance of locating Great Gray Owls in the more unsettled regions of heavy timber, north and west of Edmonton.

The first area investigated during the spring and early summer of 1952 covered the large poplar and muskeg stands west of the village of Flatbush stretching to the Athabaska River. This entailed working all suitable timbered areas by horseback and on foot, north to Smith and Fawcett Lake, south to the Vega Ferry Crossing on the Athabaska, and west across the river to Tipi Lake and Timeu. No Great Grays were discovered that year although two dead specimens had been sent from the area the previous winter. One nest of the American Hawk Owl (Surnia ulula) was found. Great Horned Owls (Bubo virginianus) were relatively numerous owing to a high rabbit population. Eight nests of this species were located.

In the spring of 1953 the search was again concentrated in areas from which dead specimens of Great Gray Owls had previously been sent. A juvenile female was shot by a trapper near Sangudo in March 1953, and an adult male was similarly disposed of by a trapper north of Timeu. Another bushman working in an area north-west of Ft. Assiniboine had shot no less than six during the winter and showed me the evidence. In the Corbett Creek area west of Ft. Assiniboine a nesting pair was shot.

No nests of the Great Gray Owl were found but thirteen nests of the Great Horned Owl were located in the course of field work in these areas.

It became apparent that some form of publicity especially directed to the trappers might prevent the needless slaughter of these birds and also lead to the finding of a nest.

A seven page brochure (Fig. 1) asking for information on the owl, complete with sketches comparing it with the common Great Horned Owl was accordingly circulated throughout the northern part of the province. Every registered trapper, logging camp and ferry operator, as well as all northern school divisions and government forestry personnel received a copy. More than 5,000 were mailed. Various country weeklies in Alberta and some of the farm publications which have an enormous circulation in Western Canada carried an appeal for information. A national weekly paper published a large picture of a Great Gray Owl with an accompanying request for available data.

Numerous people responded to the appeal and many interesting items on owls came to light. For instance, new records for the Barred Owl in Alberta were sent in.

During the winter of 1954 three dead Great Gray Owls were sent in from Anzac, Rocky Mountain House and Ft. Assiniboine respectively. Two live birds were also received. They had been trapped and slightly injured in the process.

One was taken north of Melfort, Saskatchewan, and represents the fourth record for that province (Bard, personal correspondence); the other came from Ft. Assiniboine. The Saskatchewan bird still survives and provided the material on feather sequence and molt. The remains of another Great Gray Owl were found north of Ft. Assiniboine.

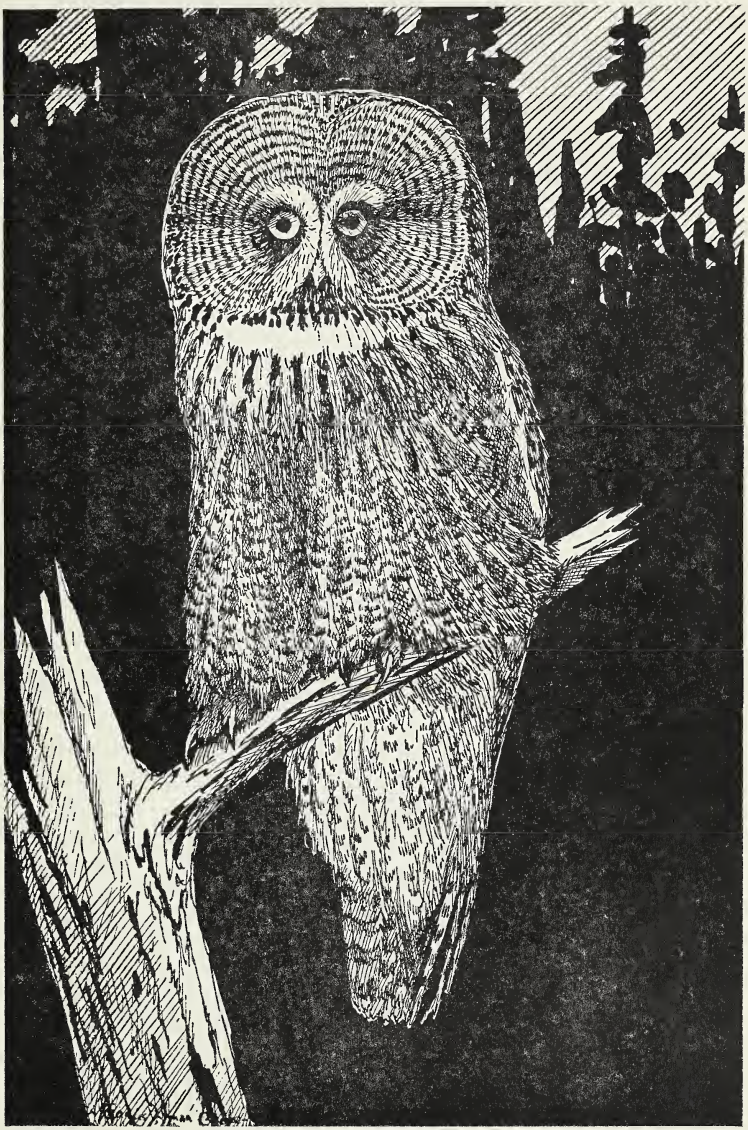
In early May, 1954, two nests of the Great Gray Owl were located in widely separated areas. Both nests contained two week-old young and these finds provided the basis for this study. All nesting activities were recorded and a photographic study was made. A good deal of original data concerning these rare birds was gathered. This marked the first substantial contribution towards a knowledge of the life history of the species.

The spring of 1955 produced no nests of this species but two more dead birds arrived, one from the Edson, and the other from the Raven district west of Innisfail. A live bird sent from Raven subsequently died in captivity.

The four year investigation produced fourteen dead Great Gray Owls, four live birds that were sent me, and two nests each containing two young.

Further interesting observations were made on the Hawk Owl, Snowy Owl (Nyctea nyctea), Barred Owl (Strix varia), Richardson's Owl (Cryptoglaux funerea richardsoni), Saw-whet Owl (Cryptoglaux acadia), Screech Owl (Otus asio) and the Great Horned Owl. A total of 36,000 miles was covered during the search period from the spring of 1952 to the summer of 1955 by car, truck, jeep, canoe, on horseback and on foot.

The Great Gray Owl



HAVE YOU SEEN THIS BIRD?

THE GREAT GRAY OWL

One of Alberta's Rarest Birds

An amazing number of Albertans have never seen this large and beautiful owl. It is in fact fast becoming one of Alberta's rarest birds and definitely in acute danger of becoming extinct in the next few years.

It is the writer's intention to attempt the writing of a complete life history of this owl and Mr. Ed Jones, well known bird expert of Edmonton, will endeavor to record much of the bird's life and activity on movie film. We have been engaged in an intensive search over the past two years travelling more than 10,000 miles for the nest of the Great Gray Owl and as yet have been unsuccessful. For this reason, through the medium of this pamphlet, I am extending this appeal for any information that readers of this publication might be able to forward.

DESCRIPTION OF THE GREAT GRAY OWL:

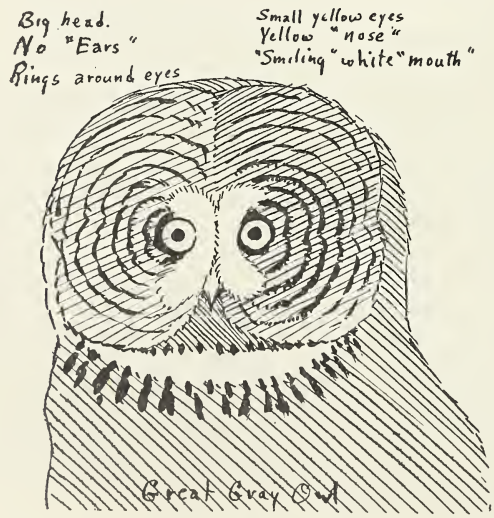
By measurement and appearance it is the largest of all our owls but when it is stripped of all its feathers, it is a surprisingly small bird. In color, this owl appears rather dark and blackish rather than the light brown or dull gray of the Great Horned Owl. Its body appears to be barred in tones of black and white throughout. An easy way to identify this owl is by its enormous saucer shaped face. The head appears very large and is without horns and the face has very distinct concentric circles of alternating black and white. The eyes are quite small and yellow in color. When you see any large owl, try to approach it as closely as possible and firstly determine whether it has tufts or horns on the head. If it has these projections on the head it will undoubtedly be a Great Horned Owl and if without these horns, and somewhat dark in appearance and large in size with an enormous head it will be the Great Gray Owl.

VOICE:

According to Mr. A. D. Henderson of Lac La Nonne, who found several nests of the Great Gray Owl some 25 years ago, this bird has a call somewhat different from the sound made by the Great Horned Owl. Mr. Henderson describes the hoot of the Great Gray Owl as more of a long drawn whistle than a deep slow hoot.

HABITS AND CHARACTERISTICS:

This owl is extremely tame and very unsuspicious and one can approach very close to it. For this very reason, these birds have offered an easy target for the guns of trappers, hunters, settlers and farmers and all others who happen to be in the northern woods where this bird is found. Scientific analysis of the stomach contents of this bird made on numerous dead specimens forwarded to the University have shown that this owl is predominantly a mouse eater and seldom bothers squirrels, game birds or even rabbits. Its feet are not nearly as strong and powerful as those of the Great Horned Owl. This is a valuable and rare owl and one that should not be shot, and I hereby request the assistance of all readers of this publication to aid in the protection of this interesting bird.



NEST AND WHERE TO LOOK FOR IT

The Great Gray Owl does not build a nest of its own but makes use of an old hawk's nest. These nests are usually found in tall poplars, more commonly the white poplar and occasionally in the tall balm of gilead or black poplar trees. Nests have occasionally been found in spruces and pines so any large old hawk's nest shoud be checked from early March to early June, the time of nesting for these birds. Groves of tall, heavy poplars are the most likely areas for old hawk's nests to be found and here the owls will nest. These nests are easily seen in the early spring before the leaves bud out on the trees and a close look at the nests will soon reveal whether an owl is sitting on it and by examination of the head you can readily tell whether it is a Great Gray Owl.

If such a bird should be found nesting, please write or phone as soon as possible to Mr. Al Oeming, Sub. P.O. 23 Edmonton, Phone 392350. If these birds should be nesting in an area where other settlers or trappers are living, please ask them to afford the birds all the protection possible and notify the writer (as above) immediately.

GREAT HORNED OWL (Compare with Cover Picture of Great Gray Owl)

The undersigned will grant a substantial reward to any person providing him with information that will lead to the nest of a Great Gray Owl.

REMEMBER TO WRITE, WIRE OR PHONE COLLECT TO: AL OEMING, SUB. P.O. 23, EDMONTON, PHONE 392350, if you have any information on this important bird.

The Great Gray Owl on the Nest in Early April

This investigation and study of the Great Gray Owl is a University of Alberta Project supervised by Dr. Wm. Rowan, head of the Zoology Dept. Your help in this scientific study is earnestly requested and will be most appreciatively received. Your information will assist greatly in this difficult and valuable research. Please help us to save our few remaining Great Gray Owls.

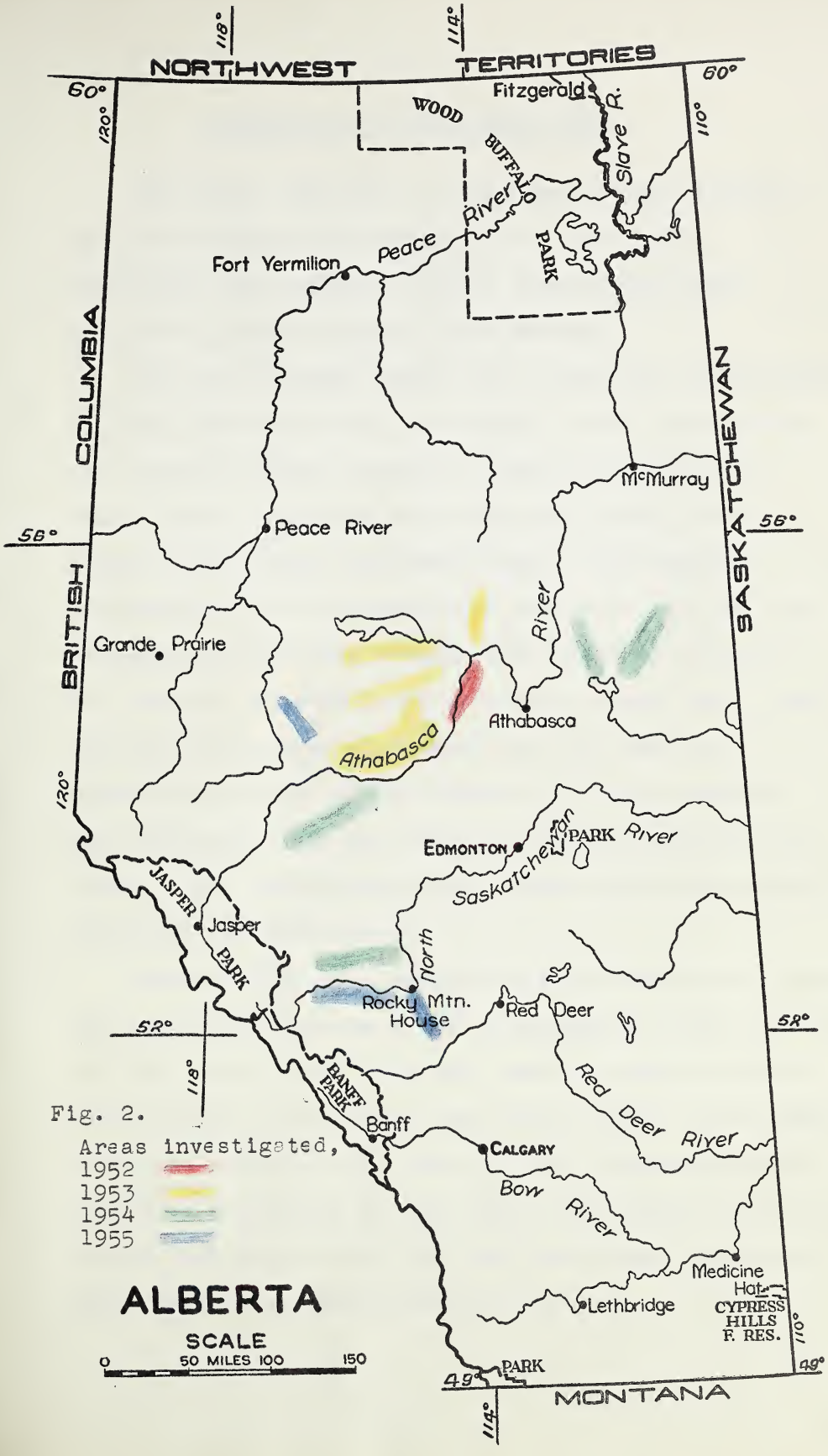


Fig. 2.

Areas investigated,
1952
1953
1954
1955

ALBERTA

SCALE
0 50 MILES 100 150

DESCRIPTION OF THE STUDY AREA

The Great Gray Owl is a denizen of deep forests. Henderson (1915) and Randall (1920) have both emphasized the fondness of this species for heavy stands of poplar fringing large muskegs.

The area covered during the spring and early summer of 1952 contained many good stands of old black poplar and several sizeable muskegs. Great tracts of this region have been burnt over and only scrubby second growth white poplar surrounds some of the muskegs. Substantial stands of old white and black poplars were encountered along the Pembina river west of Flatbush and Fawcett. Particularly extensive muskegs were found west of the village of Fawcett, but the area is practically devoid of any substantial poplar growth. The muskegs of this area are in the main tamarack and black spruce associations and provide excellent nesting locations for Hawk Owls.

Considerably less muskeg but more heavy white poplar was encountered in the areas investigated in the spring of 1953. The region north and west of Timeu contains a mixed growth of huge black and white poplar, black spruce, jack pine and tamarack. Some of the larger muskegs in this area had little in the way of old stands of poplar around them due to the fires that have swept the region repeatedly in the past twenty years.

North west of Ft. Assiniboine one finds the finest big stands of white poplar in Alberta, the Corbett Creek country having perhaps the largest growth with many muskegs scattered throughout. This area appeared to provide the ideal Great Gray habitat. Farther north of Ft. Assiniboine the deciduous woods disappear and give way to heavy and vast coniferous growth covering the undulation called the Swan Hills. The Swan Hill forests are composed in the main of lodgepole pine (Fig. 4), balsam, jack pine and black spruce. The trees are among the oldest in Alberta and no serious fire has ever reduced the "green" of this magnificent forest. Undoubtedly birds such as Great Gray Owls could spend much of their lives undiscovered in this vast, dense solitude only moving into the lower regions near Ft. Assiniboine during the winter and nesting seasons. Almost complete absence of poplar and a dearth of suitable nest sites would appear to eliminate the possibility of nesting in the Swan Hills proper.

The area north and west of Wandering River towards Pelican Portage was covered in 1954. This is a vast region of black spruce growth and muskegs, although there is an extensive poplar growth and some willow. Much of the best available spruce in Alberta is now being logged in this area, producing 1,000 board feet per tree.

The country north of Edson and west of Rocky Mountain House also provides suitable Great Gray habitat. The study area here consisted of large muskegs containing (Fig. 5) willow, alders, black spruce and tamarack. Many

are fringed with large black and white poplar (Fig. 3).

The spring of 1955 was spent checking the areas already described. The map on page 6 (Fig. 2) will serve to give some impression of the location of the study area.

Fig. 3. Typical poplar growth frequented by nesting Great Gray Owls.

Fig. 4. Dense Lodgepole Pine Growth in the Swan Hills.

Fig. 5. Muskeg frequented by Great Gray Owls in the Rocky Mountain House area.

THE GREAT GRAY OWL (Scotiaptex nebulosa nebulosa(Forster)

IDENTIFICATION AND CLASSIFICATION

Taxonomic Position

The Great Gray Owl belongs to the order Strigiformes suborder Striges, family Strigidae, genus Scotiaptex, species nebulosa and subspecies nebulosa. It was first described by J.R. Forster (1772) from a juvenile specimen collected near Severn River in north-western Ontario. The type specimen is believed to be somewhere in England but some doubt has been expressed that it still exists (Amadon, personal correspondence). Forster's description translated from the original in Latin by Dean Walter Johns is as follows:

"The Strix with smooth head, dusky colored body with many white stripes. The sixth flight feather rather long and with a dark colored crest. It lives around Hudson Bay and feeds on hares, rabbits and mice. The beak is dark yellow, the upper part more yellow than the lower. The eyes are large with yellow irises. The head is greyish in appearance from the feathers being striped with alternating dark and pale grey. Behind these feathers towards the neck there is a line of small dark feathers toward each cheek, producing a dark semicircle. The back of the head to upper and lower parts is dusky with feathers spotted with white on the margins. The breast is whitish with white stripes running up and down and across. The abdomen is white with longitudinal stripes above as on the breast, but marked below with cross stripes. The back and entirely

covering the wings and tail are striped with covering of dusky and white. The wings are dusky; the front feathers dusky with cross bands of grey, and white with cloudy cross lines. The sixth flight feather is longer than the rest with the rest rather blackish. The rest of the flight feathers are rather pale, striped with darker colors. The tail is rounded with twelve tail feathers with the two in the middle rather longer. The whole with wavy stripes of ashy white and dark with several dark double lines across. The rest of the tail feathers slightly striped with dark and light. The feet are covered with whitish feathers striped with dark. In size it is almost the same as that of Strix nyctea. The length is sixteen inches, the width four inches, and the weight three pounds."

When Forster described the Great Gray Owl as Strix nebulosa someone unfamiliar with the bird supposed he referred to the Barred Owl (Strix varia) and so consequently nebulosa was applied to the latter for over a hundred years. The name was later changed to the present Scotiaptex nebulosa (Preble, 1902). It was then transferred to the species Forster intended it for (A.O.U. 1912).

Common Names

The Great Gray Owl is known by a variety of common names such as spruce owl, cinereous owl, spectral owl, saucer-faced owl, big-headed owl and the hornless owl.

Comparison Between the Great Gray and the Great Horned Owl

Feet and Tarsi

Because of the availability of the Great Horned Owl it is compared with the Great Gray. Both species belong to the same family, Strigidae.

The feet of the two species display an interesting difference. The feet of the Great Horned Owl are considerably stronger, with the middle claw measuring up to 42 mm. in length while that of the Great Gray seldom exceeds 32 mm. (Fig. 6). There appears to be a correlation between relative length of the middle toe and the prey preferred. The Great Grays feed principally on small mammals such as mice and voles. Their feet would appear unable to take large prey such as Snowshoe Hares which the Great Horned Owls commonly feed on.

The extent of feathering on the tarsus is quite similar in both species. Both species can voluntarily assume a zygodactylous position of the toes and Great Grays appear to adopt this placement more frequently than the Great Horned Owl which usually places three toes ahead with the first toe behind.

Comparison of Heads

The heads of the two species show a marked difference. The head of the Great Gray Owl appears much larger than that of the Great Horned Owl and lacks the ear tufts of the latter (Fig. 7). The eye of the Great Gray is considerably smaller than that of the Great Horned. This can be established by measuring the eyes, length of beak from commissural point, and the length of the head and beak of live birds (Meng, 1951). The typical ratios for the two species are as follows:

	Beak to Eye	Head to Eye
Great Gray	2 : 1	6 : 1
Great Horned	1.2 : 1	3.3 : 1

A. B.

Fig. 6. Comparison of feet.

A. Foot of Great Horned Owl
B. Foot of Great Gray Owl ($\frac{1}{2}$ actual size)

A. B.

Fig. 7. Comparison of heads from life (1/3 actual size) A. Great Gray

B. Great Horned

Plumages of the Great Gray Owl

Adult plumages have been previously described (Gladden 1936) and the description of the immature bird is original. Adult Female: The general color of the upper parts is dusky, dull, grayish brown or bluish-sooty color, broken by transverse mottlings of whitish grey. The uniformly sooty centres of the feathers produce an effect of irregular dusky stripes, most conspicuous on the back and shoulders. The edges of the feathers of the breast plumage are more regularly barred. The mottling becomes more profuse on the rump and the upper tail-coverts and produces a more greyish appearance. The primary coverts are crossed with very dull or indistinct bands of paler brown. The secondaries are crossed by about nine bands (one terminal and three concealed by the greater coverts).

of light greyish-brown, becoming lighter on the edges of the outer webs. The primaries are crossed by nine transverse lines of square spots of mottled pale grey on the outer webs. The spots nearer the tips are quite indistinct except for the terminal bar. The middle secondaries and tail feathers are coarsely mottled with dusky brown or greyish-white and this color tends to form irregular bars. The rest of the tail is dusky and crossed by about nine paler bands that are marked off by a narrow line or edging of grey that in turn encloses a greyish-brown and sometimes slightly mottled space. Towards the base of the tail feathers the mottling is somewhat more confused and the bands are broken up. The basic color of the underparts is greyish-white. Each feather of the neck, abdomen, chest and breast has a broad, irregularly saw-toothed centre stripe of dusky brown or dull grey. The flanks, anal region and under tail coverts are narrowly banded with dull brown and greyish-white. The legs have narrower, more irregular bars. The "eyebrows", lores and chin are greyish-white with a dark space immediately in front of the eye. The face is greyish-white with distinct concentric semicircular bars of greyish-brown. The facial circle is dark brown passing into a very pronounced white band on the foreneck (Fig. 9). This white band is in turn interrupted by a sizeable spot of brownish-black on the throat. The bill is dull, light-yellow and the iris lemon-yellow.

Adult Male

Similar to the female but usually an over-all lighter color. The white on the foreneck is less pronounced. (Fig. 8)

Immature

In the downy stage the young are an overall greyish-white with the base of the down on the hind-neck, back, shoulders and wings sooty brown. The tips of down are pale dull buff. After the third week the immature birds show faint traces of barring on the lower breast and the semicircular rings about the eyes are pronounced. The tail is then about two inches long and shows barring. The feet are pale yellow with dark grey claws. The cere is orange-yellow and the pupil dark grey with the iris limpid yellow.

Fig. 8. Adult Male Great Gray Owl. (From life)

Fig. 9. Adult female Great Gray Owl
(Mounted specimen)

Measurements

Complete measurements of five adult Great Gray Owls were recorded (Table 1). The metric system has been adopted throughout except for weights which are in ounces. Meng (1951) favors this procedure.

TABLE I

MEASUREMENTS OF ADULT GREAT GRAY OWLS

Specimen No.	1.	2.	3.	4.	5.
Sex	F	F	F	M	M
1. Length of bill from commissural point	20	30	33	33	31
2. Length of head and bill	120	110	100	105	100
3. Length of cere	23	22	25	26	21
4. Weight (in ounces)	37	34	43	33	46*
5. Length of humerus	125	130	130	140	130
Length of ulna	140	140	142	135	142
6. Length of Manus (Wing)	100	85	80	90	80
7. Total length plus tail	520	635	660	600	635
8. Wing spread plus feathers	1066	1422	1400	1450	1270
9. Spread of foot	110	95	110	100	108
10. Length of middle toe and claw	65	60	57	62	60
11. Length of tarsus, middle toe and claw	125	120	127	122	120
12. Length of tibio-tarsus	120	120	125	120	121
13. Length of femur	100	90	85	90	90
14. Length of Tarsus	60	62	60	61	60
15. Length from anterior part of clavicle to end of pygostyle	152	213	165	196	203
16. Width of eye	16	15	14	14	16

*Specimen No. 5 was a captive bird. The weight was far above average due to excessive eating in confinement.
*Fig. 31 indicates how the measurements were taken in millimetres.

The Question of Subspecies

The species is circumpolar in distribution and has presented difficulties to taxonomists in Europe and America. It is locally variable, while marked fading occurs in old skins, complicating the issue. This is evident in the recorded descriptions and attempted recognition of subspecies (Hartert 1920).

Hartert recognizes three races in Eurasia, but later in his supplement (1932-38), repudiates them and reunites all of them into one Old World Race, Scotiaptex nebulosa lapponica, the Lapp Owl.

The Lapp Owl is remarkably similar to the Great Gray in habitat, nesting, egg size, behaviour and plumage and measurements (Hagen 1952).

Three skins on loan from the Chicago Natural History Museums and one from the New York Museum of Natural History were examined and compared with Great Gray skins. Dr. Rowan examined and measured a lengthy series of Lapp and Great Gray Owl skins in the museums of Helsinki, Lund, Stockholm and London in 1954. This information has been utilized in Table II, together with other measurements taken personally.

Because of the value of the skins on loan and the decrepit condition of these specimens, only those measurements appearing in the table were possible.

TABLE II

MEASUREMENTS OF LAPP AND GREAT GRAY OWLS

	LAPP OWL		GREAT GRAY	
	Male	Female	Male	Female
No. of facial rings	8	8	6	8
	11	7	6-7	9
	9-10	8		7
	8	7-8		7
	8	8		6-7
	7-8	8		
	9	7		
Length of left wing in mm.	430	450	441	
	430	440		437
	450	460	432	443
	440	450		465
	440	450		437
	450	460		450
Tail length in mm.	320	320	304	335
	310	330	320	330
	320	340		340
	310	320		330
	320	330		330

Summary:

Because of an insufficient number of male Great Gray Owl skins, significant comparisons are restricted to the female of the two forms.

1. Female Lapp Owls averaged 7.7 facial rings compared with 7.5 for female Great Grays.

2. Female Lapp Owls averaged 451.6 mm. for length of left wing compared to 446.4 for female Great Grays.

3. Tail length for female Lapp Owls averaged 328 mm., compared with 333 for female Great Grays.

Conclusions

From the above limited comparisons, a close similarity between the two races is obvious. This is further corroborated by personal examination of such skins as have been available of both forms. The Old World race is in general paler and more conspicuously streaked on the breast (Figs. 10,11). No other significant differences could be detected. Dr. Amadon (personal correspondence), Curator of Birds in the American Museum of Natural History in New York and one of the leading taxonomists of the continent confirms this opinion. It is also substantiated in observations and measurements by Professor Rowan on a long series of skins of both forms in 1954.

For thousands of years the Canadian and Eurasian birds must have been separated (since the Pleistocene period presumably) so that their striking similarity thus offers a point of theoretical interest, since isolation is generally accepted as one of the chief factors in species formation (Huxley, 1940). From the available facts one must assume that either a remarkable genetic stability, or similarity of habitat, has failed to induce notable variation. It is interesting to note

that another owl with circumpolar distribution, the Snowy Owl (Nyctea nyctea), has not a single recognized subspecies. However, nowhere does an isolated group exist. Owing to isolation the Great Gray Owls have varied in minor degrees from the Lapp Owl subspecies but their striking likeness suggests this process has not gone far (Ridgway, 1914).

Fig. 10. Comparison of Great Gray skins (Top Row) and Lapp Owl skins (Bottom Row). All ventral aspects. Great Gray skins appear smaller due to photographic foreshortening, under the circumstances inevitable due to the length of the skins.

Fig. 11. Comparison of Lapp (Bottom Row) and Great Gray Owl skins (Top Row). All dorsal aspects.

PTERYLOGRAPHY

Feather Tracts

The contour feathers of the Great Gray Owl may be divided into eight tracts; the capital, spinal, femoral, humeral, alar, crural, ventral and caudal tracts respectively (Figs. 12, 13). The boundaries of these tracts are quite easily seen and each tract may be divided into various subdivisions or regions. These however, are difficult to define. A true lumbar tract is absent in this species.

Methods of Investigating the Feather Tracts

The various feather tracts were determined in three ways. The first method was to examine nestlings that had not yet grown contour feathers long enough to cover the apteria. The second method was to pluck carefully a dead adult bird and note the follicles from which the contour feathers spring. The third method was to skin an adult bird and carefully clean the skin and examine it from the inside. Feather tracts show up remarkably well in this manner.

Short Description of the Various Tracts

1. The Capital Tract- The feathers of the entire head are included in this tract. It passes over directly into the spinal and ventral tracts.
2. The Spinal Tract- This pteryla extends posteriorly from the capital tract to the upper tail coverts. Along the neck it is bordered on each side by the

cervical apterium, and along the trunk it is bordered on each side by a rather large lateral apterium. This tract is divisible into four regions which are identified mainly by their shape and location. There is a narrow interscapular region extending from the area between the shoulder blades posteriorly; a saddle shaped dorsal region extending from the shoulder region to a point approximately halfway to the tail and a narrow pelvic region lying between the hips and extending from the dorsal region to the tail coverts.

3. The Humeral Tract- A short pteryla of strong growth found on each wing running obliquely backward on the brachium from the anterior end of the shoulder, where it barely coalesces with the feather tract below. The scapular feathers arise from this tract.

4. The Femoral Tract- A narrow but well developed tract on the upper outer surface of each femur, forming a sort of breeches. This is the only tract in this region, for a true lumbar tract is missing in this species.

5. The Ventral Tract- This tract covers the lower surface of the neck and extends posteriorly almost to the anal ring. The outer branch of the inferior tract is free posteriorly, thus differing from Nitzsch & Burmeister's (1840) description for the typical disc-faced owls.

6. The Crural Tract- The remaining feathers of the legs are separated from the femoral tract by a narrow apterium.

7. The Caudal Tract- This pteryla includes the rectrices, and the upper and under tail coverts. The rectrices number twelve.

8. The Alar Tract- Includes all the feathers of the wing except the humeral tract on which the scapulars are carried. The remiges or flight feathers are divided into three chief groups; the primaries, secondaries and tertiaries. There are 10 primaries with 10 greater primary coverts. The 12 secondaries are borne on the ulna. Secondary number five is missing but its covert is present. A wing which lacks the fifth secondary is said to show diastataxy or acquintocubitalism. It is met with in nearly all the Neognathine birds save the Passeres (Pycraft, 1910). The first primary is emarginated on the inner vane near the apex. The second primary is emarginated on the inner and outer vane near the apex; the third and fourth are like the second; the fifth is slightly emarginated on the outside of the vane with noticeable emargination on the inside; and the sixth shows only a very slight emargination on the outer vane.

The alula has four feathers, excluding the coverts.

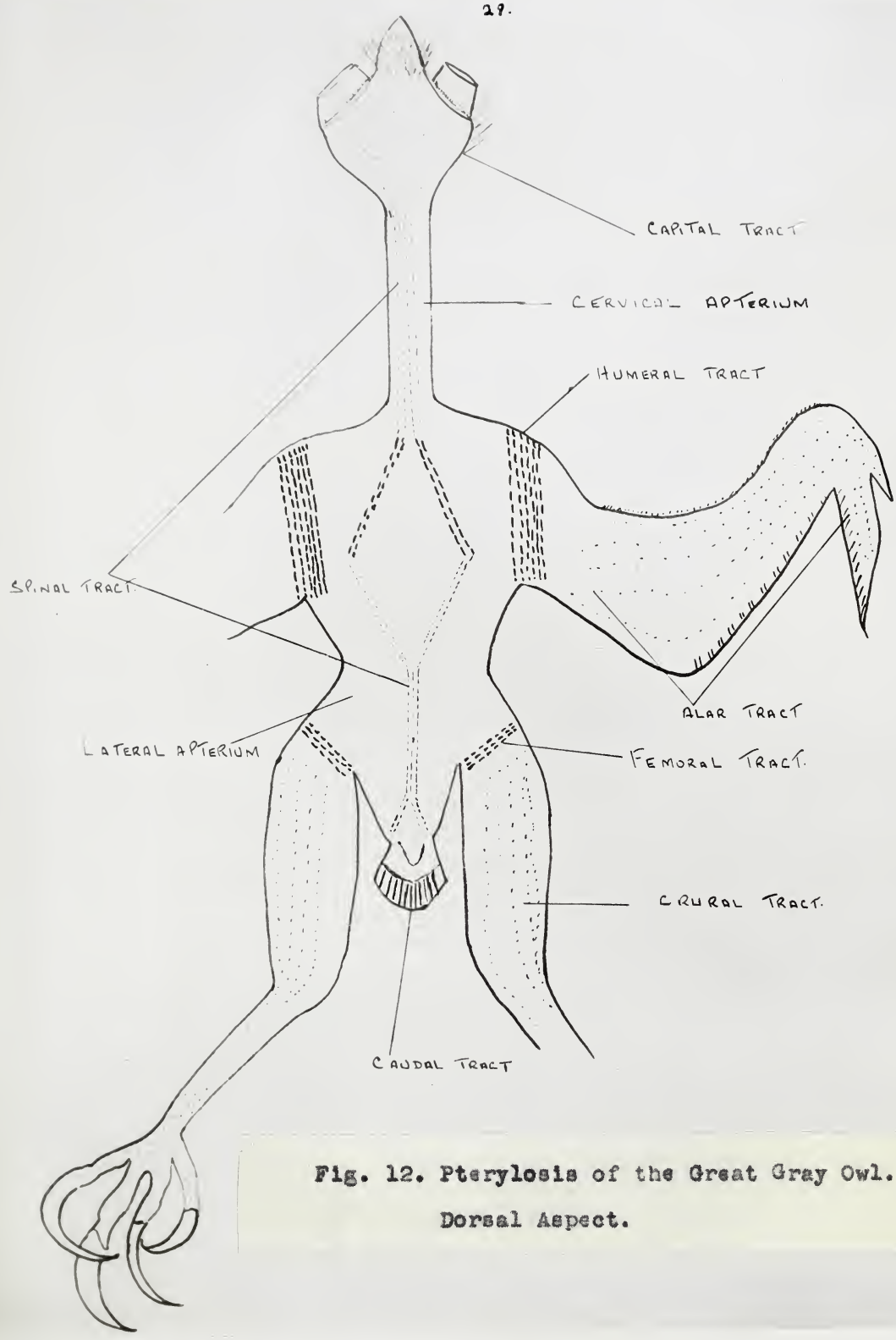


Fig. 12. Pterylosis of the Great Gray Owl. Dorsal Aspect.

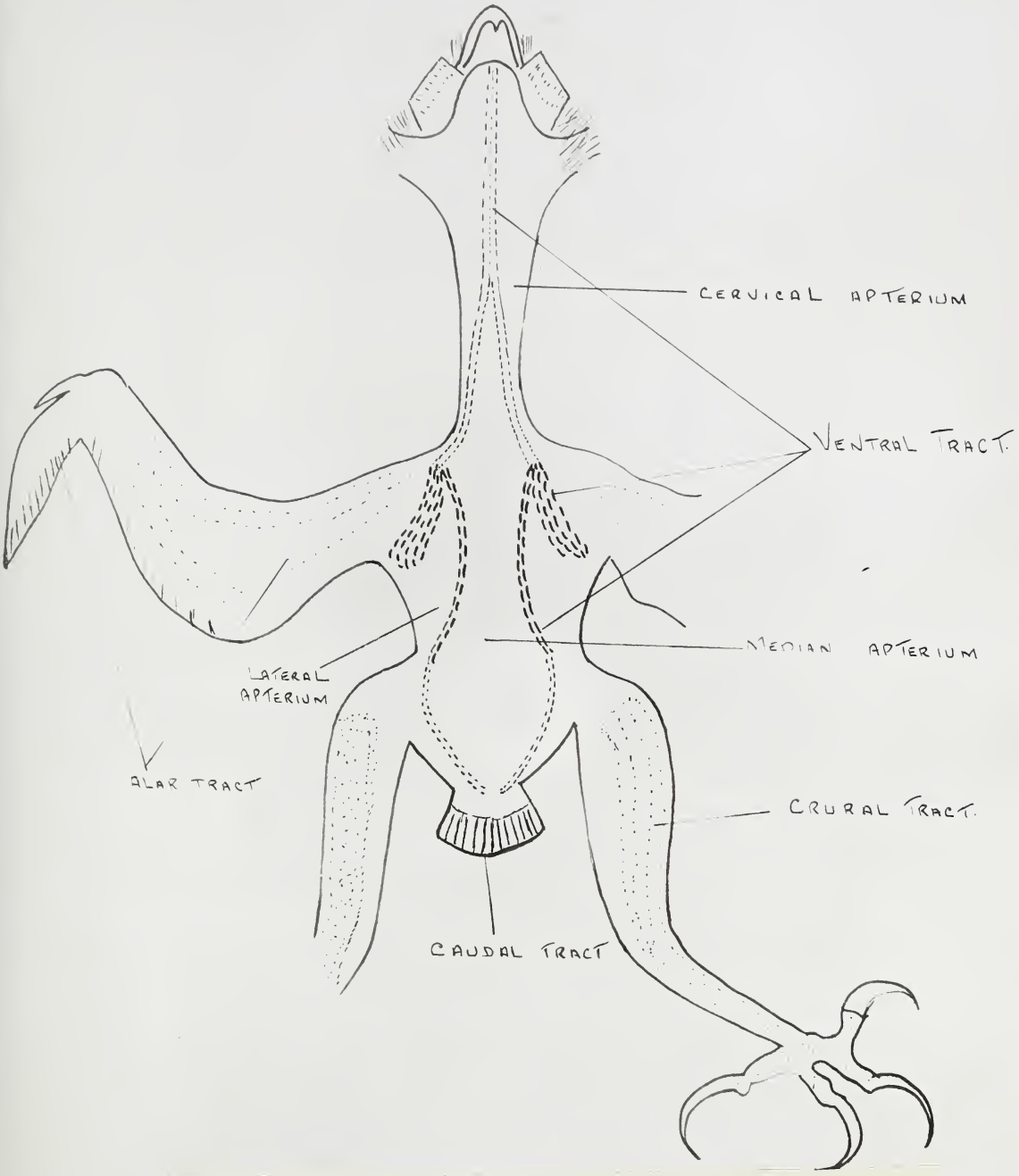


Fig. 13. Pterylosis of the Great Gray Owl.
Ventral Aspect.

Feather Structure

The Great Gray Owl is remarkable for the softness and lightness of its plumage. It was thought of interest to include a brief comparison of its feather structure with that of the Great Horned Owl.

The feathers of chief interest are those from the upper and lower breast and the upper back. These are the fluffiest contour feathers in owls.

A careful examination of these feathers revealed the following:

1. The feathers from both species possess only vestigial barbicels as revealed under microscopic inspection.
2. The average length of a Great Gray Owl upper breast feather is 170 mm. and that of the Horned 110 mm. The Great Gray Owl upper back feathers average 105 mm. as compared with 80 mm. for the Great Horned Owl.
3. The number of barbs on a typical Great Gray upper back feather average 16 per cm.. The Great Horned averages 21 per cm.. Breast feathers of the Great Gray average 13 barbs per cm., the Great Horned 17.
4. The extreme lightness and softness of the Great Gray contour feathers is further due to the extra length and fewer barbules per barb.

Molt

Only limited observations were available on the molting process of this species. The observations recorded here were obtained from a captive male, which had been in confinement since the late summer of 1954 (Fig. 14). Up to August 15th, 1955 the molt had proceeded as follows:

The bird commenced molting during the latter part of June and by August 15th had undergone these plumage changes:

1. All the rectrices have grown in with the central two or deck feathers having been the first dropped. Under and upper tail coverts are now completely grown in.
2. Primaries 3,4, and 5 (counting from the outside in) have been replaced on both wings, and secondaries 1,4,6,7,8 and 9 are newly grown in. Molt appears to have been completed for the secondary coverts which appeared to be lost simultaneously. The alula has completed its molt. The middle and lesser coverts appear to be shed and replaced somewhat irregularly with very few new feathers appearing thus far.

3. The lateral areas of the breast molt first. The molt continues posteriorly.
4. The part of the back to molt first is the area between the shoulders, and the feathers appear to be replaced in both directions.
5. The feathers as yet not molted are those at the front of the head, back of neck, centre of back, chin, tibio-tarsus and tarsus.

Normal molting proceedure is often completely upset in captive birds, so a detailed record of feather sequence is thus of doubtful validity. .

Fig. 14. Dorsal view of molting Great Gray. The new feathers appear darker than the old ones.

Eye Color

When the young are less than ten days old the iris is a very pale yellow and the pupil a greyish blue. As the owls become older the yellow strengthens and the pupil becomes a darker grey. By the time the young are three weeks old the pupil has become a very dark blue and at the end of the sixth week the young owls possess dark pupils and the typical lemon-colored iris of the mature bird. Compared with those of the Great Horned Owl the eyes are considerably smaller.

ANATOMY

This being primarily a field study of the Great Gray Owl, no detailed anatomical study of the species has been attempted. In any case the paucity of material has precluded any such undertaking. Since the anatomy of the bird is virtually unknown however, the following facts are recorded.

Intestinal tracts were taken from two adult male and female specimens of the Great Gray that had undergone considerable disintegration after a lengthy period in formalin preservative. A complete tract was also taken from a freshly killed adult female Great Horned Owl. A brief comparison of the intestinal tracts of both species was thought to be of interest (Fig. 15).

1. The caeca of the Great Gray measured 72 mm. in length compared to 90 mm. for the Great Horned Owl.
2. The large intestine of the Great Gray was 42 mm. in length; the Great Horned 70 mm.
3. The small intestine of the Great Gray exclusive of the duodenum, appears larger in diameter.
4. The caecal diameter of the Great Gray is also slightly larger.
5. The pancreas of the Great Gray appears smaller than that of the Great Horned.

6. The gizzard, gall bladder and kidney appear to be of equal size in both species.
7. Better differentiation of the proventriculus from the gizzard was noticed in the Great Horned Owl.
8. The heart and liver of the Great Gray appear larger than the same organs of the Great Horned.

The intestinal tract of the Great Gray presents no remarkable difference from that of the Great Horned Owl. Both species appear to conform to the general anatomy of owls as outlined by Gadow & Selenka (1891 and Pycraft (1910).

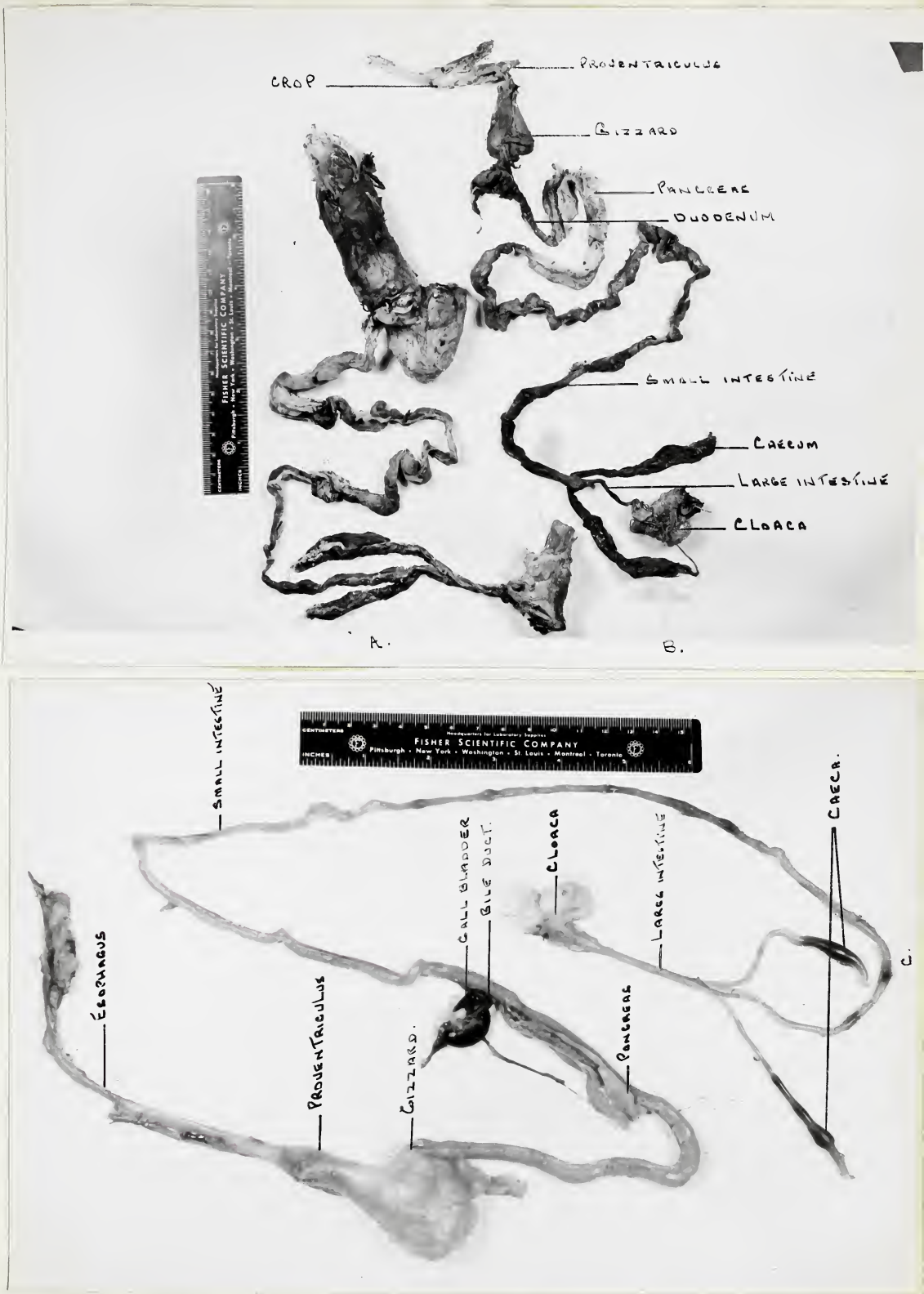


Fig. 15. Intestinal tracts
A. Male Great Gray
B. Female Great Gray
C. Female Great Horned Owl

Skeleton

Only one complete skeleton of an adult Great Gray Owl was available for study and the chief structural differences between this and the skeleton of an adult Great Horned Owl were noted.

The feet afford a striking difference, those of the Great Gray being half the size of the Horned Owl's. The leg lengths of the two species are fairly similar. Measurements of the leg bones are as follows:

	GREAT GRAY	GREAT HORNED
Femur	85mm.	85mm.
Tibio-tarsus	110mm.	120mm.
Tarsus	55mm.	60mm.
Middle toe and claw	57mm.	92mm.

Wing bones also show little difference in the two species and are listed as follows:

	GREAT GRAY	GREAT HORNED
Humerus	125mm.	140mm.
Ulna	130mm.	150mm.
Manus	100mm.	110mm.

Another outstanding difference between the two skeletons lies in the sternum and rib structures and correlated muscles. The Great Gray possesses a smaller sternum and lighter ribs. The sternum of the Great Gray measured 50 mm. in length and that of the Horned Owl 70mm..

The shoulder girdle, sternum and all correlated muscles are so much lighter and weaker in the Great Gray Owl as to prevent it from preying on anything but small quarry.

Skull

The palate, desmognathous (indirect), is typical of owls (Stresemann, 1934). The ear apertures of the Great Gray Owl show remarkable asymmetry. The aperture on the left side of the skull is noticeably larger than that of the right side (Figs. 16,17). Pycraft (1910) has described this modification for Tengmalm's Owl (Aegolius funereus) as follows:

"On the left side of the head the combined post-orbital process and tympanic wing of the exoccipital forms a large outstanding shield extending downwards to the level of the lower jaw so as to leave a narrow chink between itself and the bony ring of sclerotic plates surrounding the eye. The chink traced inwards gives way to a large chamber, in the floor of which will be found the passage to the middle ear. On the right side this chamber is wholly exposed but for a tongue-shaped plate of bone which, extending forward to the bony rim of the eye, encloses the lower half, leaving a small triangular space lying immediately above the lower jaw."

The skull of the Great Gray Owl conforms very closely to this modification. No special significance has been attached to this asymmetry.

Fig. 16 Left side of Great Gray skull showing large ear aperture.

Fig. 17 Right side of same skull indicating smaller ear aperture.

DISTRIBUTION AND MOVEMENTS

Breeding Range

During the nesting season this species is found as far north as Alaska and south as far as the Yosemite Valley in California (Bent, 1938). Definite nesting records for the latter region exist (Bleitz, personal correspondence). Two nests were recorded by Craighead (personal correspondence) for Wyoming. Roberts (1932) has found the birds nesting in (Fig. 18) northern Minnesota. There are a few other observations that suggest successful nesting in other locations. Among these are the Gaspe country of Quebec, northern Ontario (Taverner, 1912), northern Manitoba and northern Saskatchewan, Alberta and British Columbia.

No authentic nesting records have been established for Saskatchewan or British Columbia (Bard, personal correspondence; Munro & Cowan, 1947). Alberta has yielded twenty-three established nesting records. They include thirteen nests found by Henderson in the Belvedere area, five by Randall in the Athabaska country, two by Twomey in the Fawcett district, one by Dippie (Macoun, (1909) in the Red Deer district in 1896 and two found by the author in the Edson and Rocky Mountain House regions (Fig. 19).

Alaska and Arctic Canada have produced three further nesting records. However, Cade (personal correspondence, 1953) states the bird is now extremely rare in Alaska.

McDonald (personal correspondence, 1952) believes the birds breed in various wooded sections of the North West Territories being more common to the south and west of Great Slave Lake and extending down the McKenzie river to Fort Good Hope. Two nests have been noted by McDonald in this region. He considers the species very rare for the region.

Preble (1908) records one nest along the McKenzie river and has a record of another nest with two eggs taken at Fort Providence. McFarlane (1908) in a manuscript list, records a nest containing two fresh eggs near Fort Good Hope. Apparently the breeding range for this species is in the timbered regions of central and northern Canada, from Hudson Bay west to Alaska and the Pacific coast, and south in the mountains to central California.

Winter Range

This species is not known to undertake regular southward movements, but at times (possibly owing to a food shortage) it extensively invades more southern (Bent,1938) regions. In years past great numbers of these owls came through southern Ontario and extended as far south as Massachusetts, New York and Wisconsin. To the west they have been recorded during the winter in Oregon, Iowa, Indiana, Nebraska, Montana, Washington and southern

British Columbia (Fig. 18). Ontario, particularly the Toronto area, had its last substantial invasion during the winter of 1889-90. These flights continued until the winter of 1910-11 and then apparently ceased. Since then four birds have occurred in the Toronto region (Baillie, 1947). According to Dippie (Macoun, 1909) during the winter of 1896, Alberta was alive with owls of every description, Great Grays being particularly abundant. The great southward movements ceased in Alberta more than thirty years ago. Wolfe's (Edmonton) taxidermy records bear this out. It is estimated that at least half a dozen Great Gray Owls are shot each winter in areas in Alberta where they normally do not occur.

Banding Recoveries

The U.S. Fish and Wildlife Service records reveal that prior to this study only two Great Gray Owls had ever been banded. These were adults taken at Centre Island, Toronto, Ontario by H.H. Southam on January 18, 1947.

Two young were banded by the author in June 1954 in the Rocky Mountain House region and a third in June of the same year in the Edson area. No banding recoveries have ever been reported (Duvall, personal correspondence).

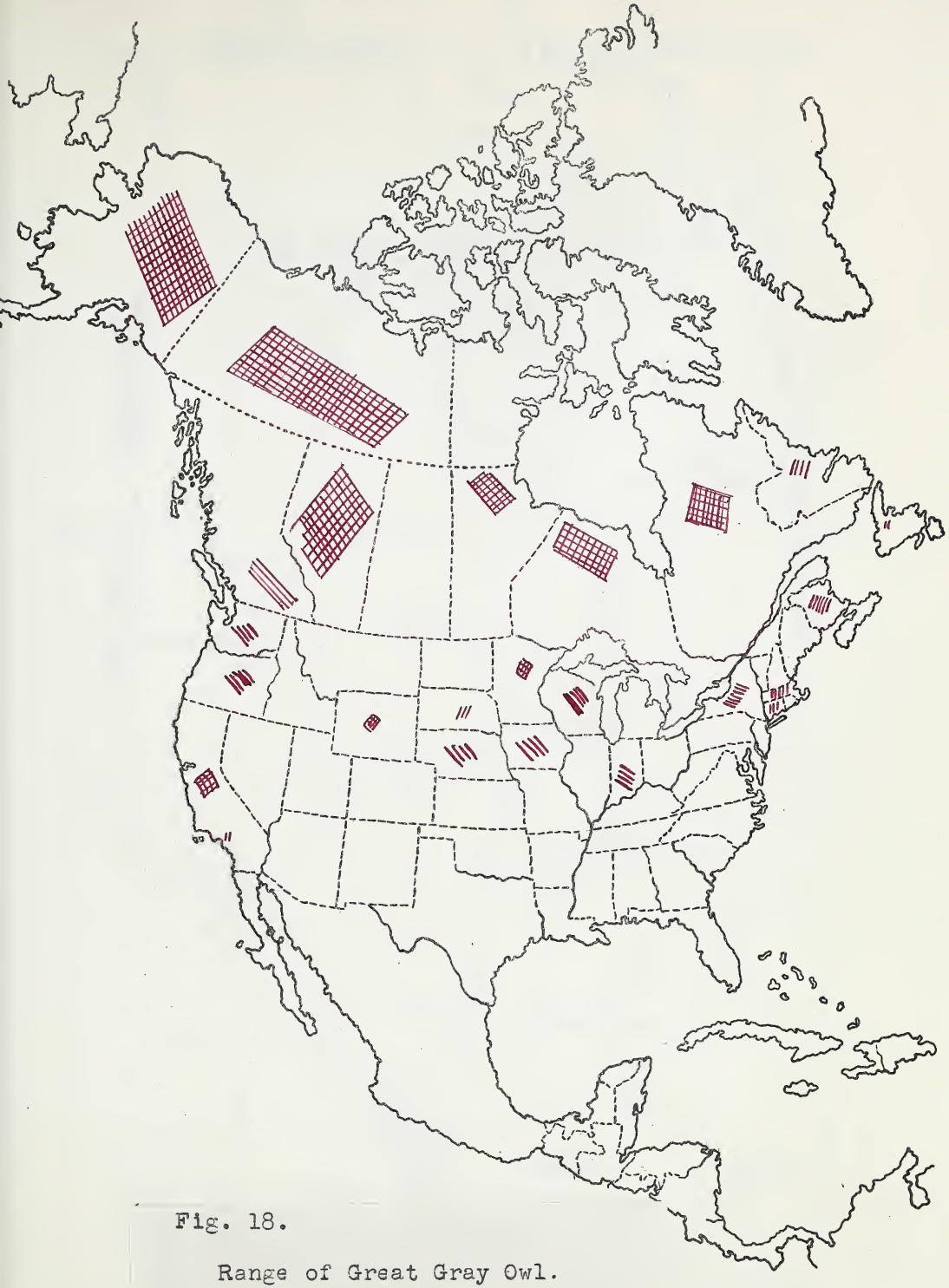


Fig. 18.

Range of Great Gray Owl.

Breeding Records

Winter Range

In North America.

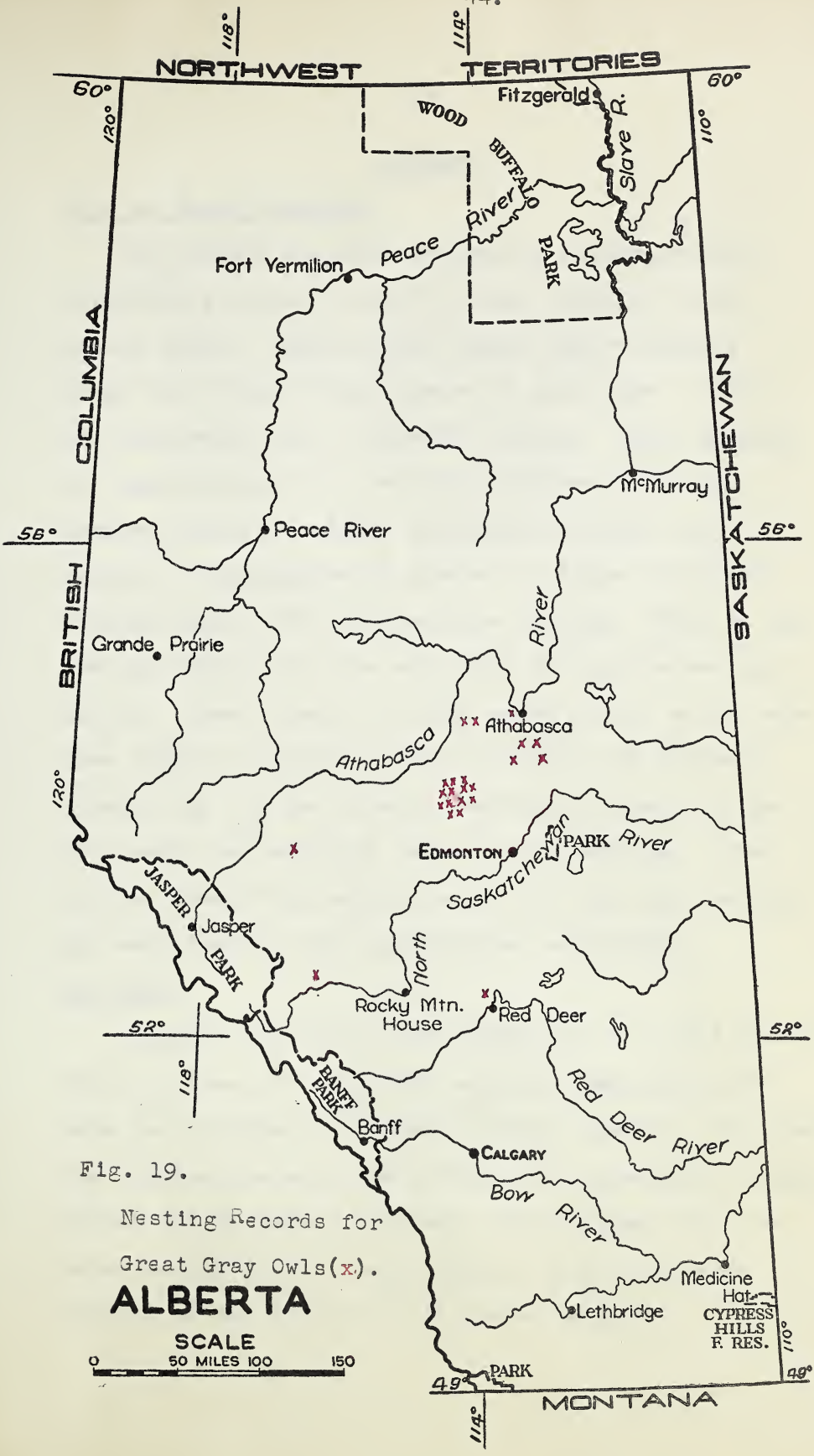


Fig. 19.

Nesting Records for Great Gray Owls(x).

ALBERTA

NESTING

Type of Woods Preferred

In Alberta the most frequently chosen nesting territories appear to be the large white or black poplar woods. These poplar stands may be lightly mixed with either black spruce or jack pine. Nests are preferably near a sizeable muskeg. These muskegs are characterized by a variable mixture of trees, shrubs, grasses, sedges, horsetails, mosses and lichens. They conform in general to those described by Moss (1953), for northwestern Alberta. This is the hunting habitat for the male bird during the nesting period. Great tracts of these heavy poplar woods were once common throughout most of central and northern Alberta but are now chiefly confined to areas in the north-west and northern parts of the province. The typical Great Gray nesting woods are deep and secluded and well removed from agricultural activities.

The Nest

Randall (op. cit.) and Henderson (op. cit.) believe this owl does not build its own nest, but prefers to make use of those discarded by other raptors. In Alberta the species has made use of the nests previously occupied by Red Tailed Hawks, Goshawks, Great Horned Owls and occasionally Crows. Twice Randall found the birds nesting on the top of an old spruce stump.

The twenty-three nests found in Alberta were in the following locations, with the height indicated in feet.

Aspen poplar (Populus tremuloides):- 45,50, 40,50,35,40,45,45,45,45,80,30,50,40,45.

Tamarack (Larix laricina):- 50,10.

Black Spruce (Picea mariana):- 40,25,18.

Balsam Poplar (Populus balsamifera):- 40,30, 40.

Position and Condition

In the deciduous trees the site is usually in a crotch formed by two or three main branches (Fig. 21). Other nests found in coniferous trees were in heavy branches near the trunk.

The birds will frequently use nests in such flimsy and decrepit condition that the eggs are plainly visible from beneath. Neither Henderson nor Randall noticed any attempt by the birds to recondition the nest. Twomey (Bent, 1938) noted that one nest he discovered near Fawcett contained fresh tips of green pine needles and some newly added twigs. Personal observations agree with the findings of Henderson and Randall.

Selection of the Nesting Site

Henderson (op. cit.) reports the birds are seen and heard in the general vicinity of the nesting site approximately three weeks prior to actual nesting. The

birds are then quite noisy and the long-drawn hoot of the male is heard for some distance. The site is usually selected by the first week in April and frequently the birds return to the nest of a previous year. The birds remain vociferous until well after the nesting has commenced.

Courtship

In the early summer of 1954 I observed a pair of captive Great Gray Owls undergoing what appeared to be a form of courtship activity.

The male would fly to the female's stump and face her. Standing face to face with breasts touching, he would commence rubbing his beak over hers, at the same time uttering a faint droning or humming sound. Often he would circle her face with his beak in a similar manner. This was observed regularly for eight days and would occur at anytime during the day or night.

The female died a short time after this activity was observed and a post mortem examination revealed slight ovarian development, while the oviduct appeared more enlarged than one would expect in the quiescent state. The ovary was approximately three times the size of an inactive organ, which would suggest that she was at least partially in breeding condition.

A similar courtship has been recorded for Barred Owls (Bent 1938).

Fig. 20. Nest and eggs of Great Gray Owl

Fig. 21 Typical position of nest in White Poplar.

Nesting Density

An accurate estimate of the nesting density of this species is extremely difficult to determine owing to the small number of nests located. The fact that the brochure circulated throughout northern Alberta revealed only two nests is some indication that this species does not have a heavy nesting density in the province. When one considers that trappers cover every square mile of Alberta's remaining wilderness at a time when the birds are most conspicuous and noisy, it may be assumed that the birds are, in fact, very scarce.

THE EGGS

Egg Dates

The earliest Alberta record for a complete clutch is March 23. The majority of nests have complete sets by the 15th of April. Dates for complete sets in the province are as follows:

March 23, March 30, April 1, April 6, April 10, April 11, April 20, April 22, April 25, April 27, April 29, May 1, May 5, May 7, and June 4.

These are not first egg dates, but when egg collectors happened to find the nest.

Number

The number of eggs laid varies from two to five with three per clutch being the most common (Fig. 20) and two

the next. Of the twenty-three nests for which records have been obtained, three contained five eggs, five had four eggs, nine contained three, and six two eggs.

Color

The color is dull white and there appears to be no visible difference in this respect from the color of the eggs of other owls (Henderson, op. cit.).

Shape and Measurements

The eggs are small for the size of the bird, and are not so round as the eggs of most other owls, being between oval and elliptical-oval in shape (Henderson, op. cit.). The shell is not glossy but is rather roughly granulated. Measurements of twenty-four eggs from Alberta nests average 54.3 mm. by 42.4 mm.. The eggs showing the four extremes measure 63.5 by 48, 52 by 43.9, and 55 by 40.8. Bent's measurements for 52 eggs are as follows:- Average, 54.2 by 43.4 mm; extremes 58.7 by 49, 48 by 42, and 53.4 by 41 mm.

The type specimen egg(No10277) was collected from a set of two by Mr. J. Sibbiston near Ft. Yukon, Alaska in April, 1864 (Bendire, 1892).

Incubation Period

Unfortunately the nests found in the course of this investigation both contained newly hatched young and no incubation data are available. An exhaustive check of all other available literature on this species has revealed nothing.

Henderson (op. cit.) and Randall (op. cit.) consider all the incubation to be performed by the female. She does not leave the nest even to eat as the male brings her the food which she devours on the spot. Of the several nests that Henderson observed, he never once saw the male incubating.

Nests of Other Birds Found in the Vicinity of Great Gray Owls' Nests.

The following is a list of the nests of other birds found near or in the general vicinity of the Great Gray nests, during the spring of 1954.

Red-tailed Hawk (Buteo borealis)

Ruffed Grouse (Bonasa umbellus)

Myrtle Warbler (Dendroica coronata)

Slate-colored Junco (Junco hyemalis hyemalis)

Spruce Grouse (Canachites canadensis)

Other birds believed to be nesting in the general area of the owls' nests because of their almost constant presence are as follows:

Ruby Crowned Kinglet (Corthylio calendula)

Golden Crowned Kinglet (Regulus satrapa olivaceus)

White throated Sparrow (Zonotrichia albicollis)

Hudsonian Chicadee (Penthestes hudsonicus)

Black Capped Chicadee (Penthestes atricapillus)

Red-breasted Nuthatch (Sitta canadensis)

Canada Jay (Perisoreus canadensis)

It is interesting to note that the remains of a dead Barred Owl (Strix varia) were found quite near the base of a Great Gray's nesting tree near Rocky Mountain House. The body was too decomposed to enable a determination as to cause of death. A Barred Owl was also heard hooting in the Edson area very close to the site of another Great Gray nest. The little Slate-colored Junco was the only bird that was noticed objecting vigorously to the presence of the owls. The owls paid no attention to the smaller birds.

Reactions to Intruders

Man

I can think of no Alberta bird which is less wary of man than the Great Gray Owl. The female will normally sit very tight if she is on eggs or small young and often it requires strenuous pounding of the nest tree to force her off. Henderson and Randall (op. cit.) recall several occasions when the female almost allowed herself to be touched by the investigator climbing the tree. The male is invariably some distance from the nest and will call repeatedly in a low, long-drawn hoot. When the female does leave the nest she will commence regular hooting of a short, plaintive nature (Fig. 25) while perched in an adjacent tree.

After the eggs have hatched, the female becomes

more solicitous about the nest, and beak-snapping and more excited calling will result if the young in the nest are handled. When the young have reached the age of three weeks, the female becomes even bolder, and on one occasion at the Rocky Mountain House nest site, flew menacingly at the author. She continued vigorous beak-snapping and would often perch a foot from the nest, while the young were being examined (Fig. 22.).

Fig. 22. Female Great Gray threatening to attack investigator at the nest.

Other Intruders

On one occasion a Red-tailed Hawk was seen diving at a female Great Gray Owl. The owl immediately assumed a defensive attitude, hunching the shoulders and fluffing out the feathers (Fig. 23). She made no attempt to fly at the hawk, which in turn made no further assaults.

The presence of dogs near the nest always caused the female owl to adopt the same defensive pose.

Fig. 23 Great Gray female in defensive attitude.

VOICE

Introduction

Randall (personal correspondence) notes that the chief obstacle to observing the owls out of the breeding season is their remarkable quietness, an observation corroborated by three captive birds kept over the past two years. These birds only became vocal with the advent of the mating season, and when assuming a defensive pose.

During the breeding season the male emits a very long-drawn call which lacks the depth and throatiness of the common Great Horned Owl. The female's response is always a shorter and somewhat screechier note and again bears no resemblance to the deep hooting of the Horned Owl. Henderson (1923) was the first to draw attention to the remarkable differences in the quality of sounds produced by the Great Gray Owl and the Great Horned Owl.

In the following list the various notes the owls utter and the circumstances under which each call is given, are described.

Voice of Adult Female

1. A soft, dove-like ooh-ah, at times very weak and more like a coo than a hoot. The sound is not loud and carries no great distance, usually tapering to a high raspy note at the end. It is repeated at irregular intervals throughout the day when the bird sits on the nest or perches in adjacent trees (Fig. 25).

2. An excited, intense hooting like ooh-uh repeated quickly and loudly. This was the signal that the male was arriving with food and she would immediately begin to hunch on the nest and continue to call until she had taken the food from him.
3. A fast repeated but faint who-who-who-who-, uttered by the female when assuming a defensive attitude. This note and attitude has also been recorded in captive birds when alarmed by people or cats prowling nearby.

Voice of Adult Male

1. A long-drawn hoot rather like a whistle, whoo-oo-oo uttered near the nest, and often heard when the male could not be seen. It was often emitted when the bird was hunting in the muskeg.
2. A steady rumbling or pumping noise like oom-ah, oom-ah, repeated for a minute or two and then started again whenever the male came close to the nest and the young were being handled. The throat of the male could be observed to maintain a pump-like motion and the beak appeared not to open.
3. A screechy whistle-like ee-ah, eee-ah has been recorded only from captive birds and is uttered at any time throughout the day most frequently in the spring and early summer.

Voice of the Young

1. When still in the nest, the young would emit a very raspy screech, appearing to indicate hunger. These sounds would subside as the young were being fed and give way to a soft, chirp-like utterance.

2. A much louder, screech-like noise, eee-ih, emitted by the young after they had left the nest. An imitation of this sound proved the best way to locate the adults after the young had entered the hunting muskeg.

Some authors attribute a tremulous, vibrating noise to this species (Bendire, 1892). I have never heard it and Henderson and Randall have never recorded it.

Activities of the Female on the Nest

During the incubation period the female sits very quietly on the nest. She arises occasionally to preen herself and to turn the eggs. The bird is most attentive to all movements, and watches all actions with great curiosity (Henderson, op.cit.). The female was observed sleeping beside two-week-old young at which time they presumably no longer required brooding. The mother will continue to remain near the nest at all times until the young are old enough to leave. She shades them during excessively hot weather and often sits with them after (Fig. 24) a meal. After the young are three weeks old, the female spends very little time about the actual nest, though remaining always in the immediate vicinity.

Activities of the Male About the Nest

Henderson and Randall (op.cit.) never saw the male bird incubating. He visits the female at the nest regularly with food and spends almost all his time hunting, never lingering about the nest after offering her the food. As the young become older, the female will fly from the nest to meet the male for the food exchange.

He usually approaches the nest from the same direction and leaves by the same route.

Feeding Times and Places of Adults and Young

Before the Nesting Season

Great Gray Owls do most of their hunting prior to the nesting season in the late afternoon. Their activities during this period will only be sufficient to allay their own hunger, when prey will be eaten on the handiest stump. With the advent of the family the male inevitably increases his hunting activities, he being the sole provider.

During Incubation

No personal observations were made at this time but Henderson's notes describe the activity as similar to that carried on after incubation.

After Incubation

During the first ten days of the life of the young owls the male is making rapid and frequent trips with food to the nest. A typical feeding schedule for a day during this period is as follows:

May 9/54	1st Feeding	9.35 AM
	2nd "	10.30 AM
	3rd "	12.25 PM
	4th "	12.45 "
	5th "	1.10 "
	6th "	2.10 "
	7th "	3.10 "
	8th "	4.10 "
	9th "	4.30 "

A typical schedule for a day during the second week is as follows:

May 16/54	1st Feeding	9.15 AM
	2nd "	11.30 "
	3rd "	12.30 PM
	4th "	5.30 "
	5th "	5.50 "

During the third and fourth weeks the visits became less frequent with not more than three trips per day recorded. The infrequency of daytime feeding despite numerous fresh pellets or castings, suggested supplementary feeding by night. A typical schedule for a day during this period is as follows:

May 23/54	1st Feeding	8.00 AM
	2nd "	11.30 "
	3rd "	3.40 PM

The fourth week's daily feeding schedule was more difficult to determine for the young were away from the nest and continually shifting location. Night feeding was again indicated. As the trips by the adults with food became less frequent, the young birds also became more silent in contrast to their earlier behaviour.

Food was always transferred from the beak. Never was the male observed to carry prey in his claws and the female always accepted it from the male with her beak.

Fig. 24. Female Great Gray Owl feeding young at the nest.

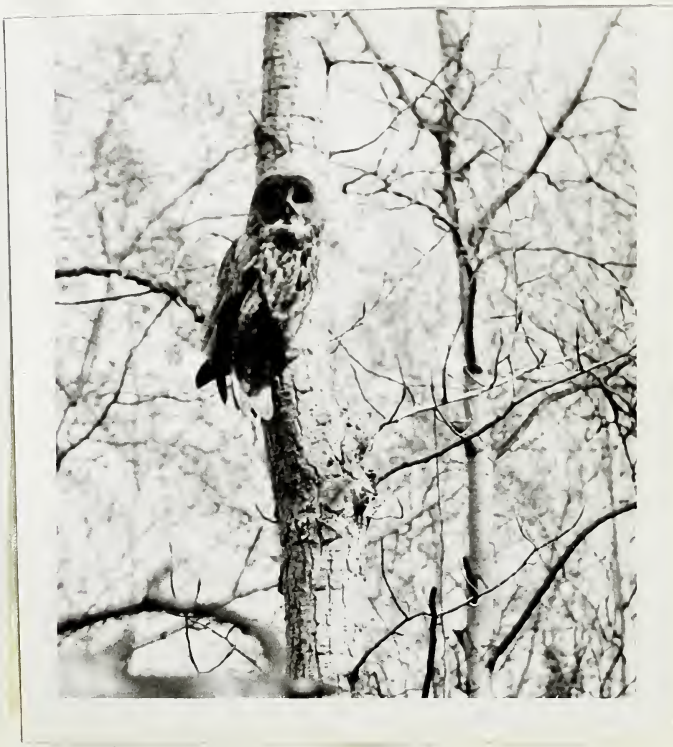


Fig. 25. Female Great Gray in tree adjacent to nest, emitting soft dove-like call.

Description of the Young

Ten Days Old (Approximately)

The young are still covered in downy feather growth, that appears greyish, ashy white (Fig. 26). The bill is yellow with darkish-blue in front of the nares. The pupil is bluish with the iris greenish yellow. The cere is yellowish orange.

Fourteen Days Old (Approximately)

The downy feathering has acquired a distinct asny grey throughout. Faint barrings are visible in the scapular region (Fig. 27). The breast is lighter and more creamy grey, the cere greenish yellow with a very pronounced centre piece, orange in color.

Fig. 26. Nest, with young approximately ten days old.

Fig. 27. Nest, with young approximately 14 days old.

Twenty-one days old

Quite a number of feathers can now be seen protruding through the dense down. A faint tint of brown around the eyes and the first semblance of a facial disc-ring is noted developing about the eyes (Fig. 28). The hindneck has become more brownish while the back and wings show signs of feather growth. Barring over the back is noticeable with alternating dark and light coloring of an ashy brown. The tarsus is well covered

in ashy grey down, bristle-like feathers around the cere are black and approximately half an inch in length. The pupil is darkish blue and the iris a weak limpid yellow. Joint of the tarsus and the metatarsus is pale orange in color.

Fig. 28. Young Great Gray Owls, approximately 21 days old.

Twenty-eight Days Old

By this time the owls are almost completely covered with feathers except for the down of the head, legs and abdomen (Fig. 29). The rectrices are developing

well and showing signs of barring. The facial rings about the eyes are getting conspicuous, with a more pronounced brown color.

Fig. 29. Young twenty-eight days old.

Forty Days Old

The back is now well feathered with no traces of remaining down. The first remiges are well developed with some downy growth still near the rectrices (Fig. 30). The head is still downy but

feathers are beginning to cover the tarsi and feet. Feathers are also developing on the abdomen. The head has a frosty appearance of greyish-brown with white. There is a better development of the facial rings about the eye. The joint between tarsus and tibio-tarsus is bare and orange in color. The bill is green with a yellow tip. The cere is less orange and somewhat greener. The iris remains pale yellow with the pupil a bit darker blue than previously noted.

Fig. 30. Great Gray Owls forty days old.

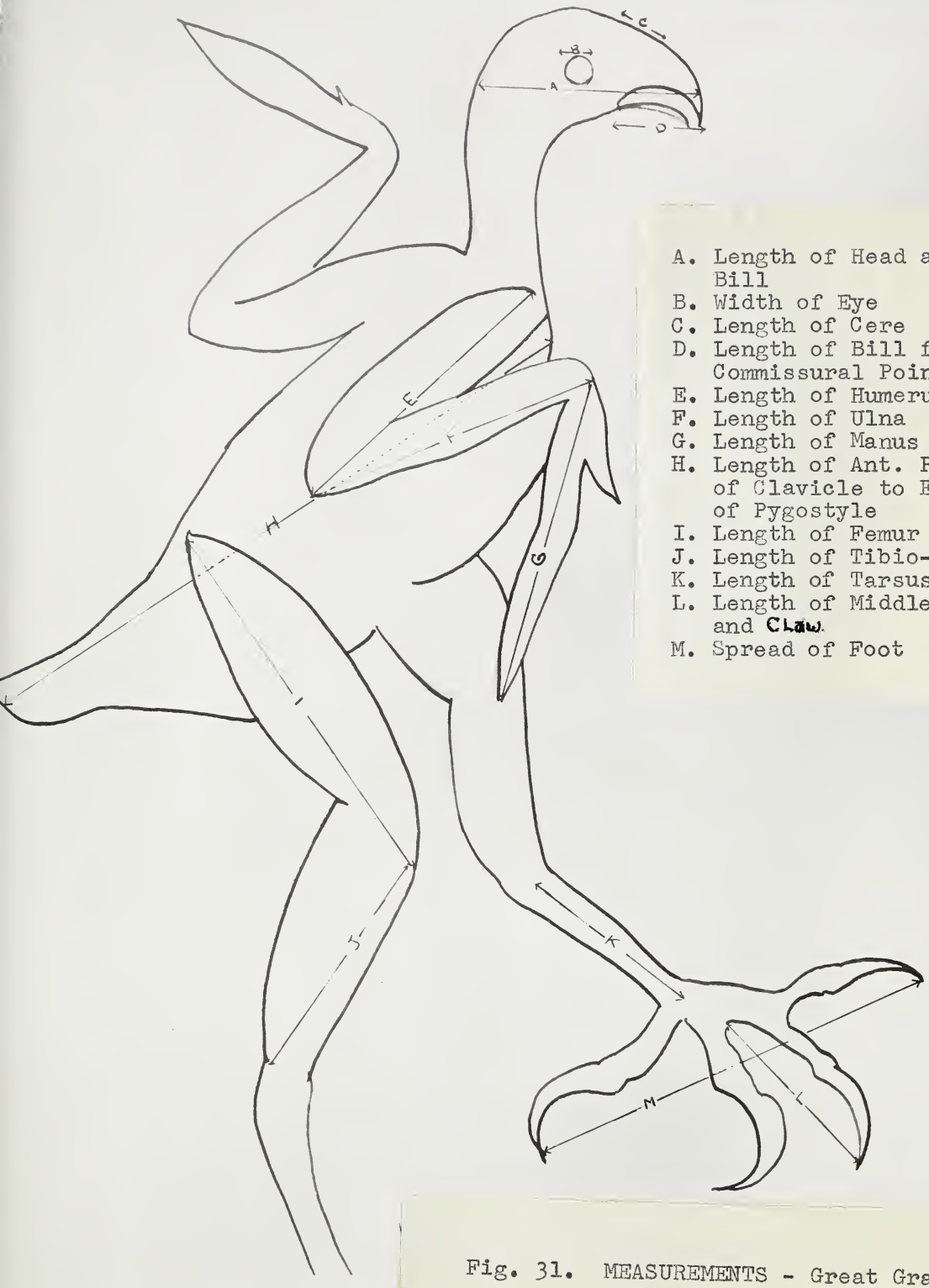
(The age of the young from both nests is assumed on the basis of information provided by trappers residing in the study areas.)

Physical Development of the Young

Explanation

Complete measurements for four young owls were obtained at the age of fourteen days, for three young at twenty-one, twenty-eight and forty days. Sixteen different measurements were taken and included the following (Figs. 31,32):

1. Length of bill from Commissural Point
2. Length of head and bill
3. Length of cere
4. Weight
5. Length of humerus and ulna
6. Length of manus (wing)
7. Total length plus tail
8. Wing spread plus feathers
9. Spread of foot
10. Length of middle toe and claw
11. Length of tarsus, middle toe and claw
12. Length of tibio-tarsus
13. Length of femur
14. Length of tarsus
15. Length from anterior part of clavicle to pygostyle
16. Width of eye



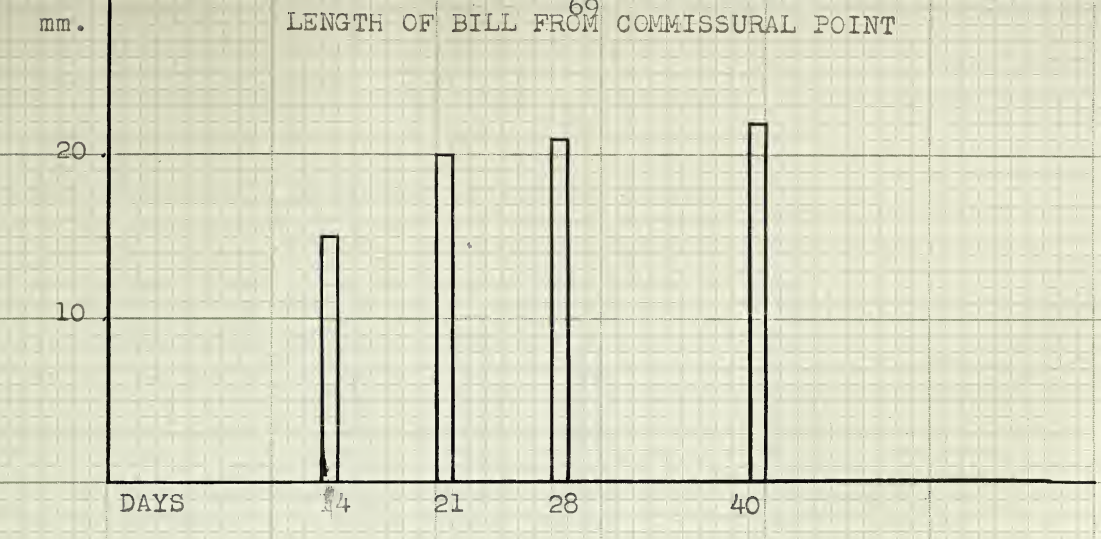
A. Length of Head and Bill
B. Width of Eye
C. Length of Cere
D. Length of Bill from Commissural Point
E. Length of Humerus
F. Length of Ulna
G. Length of Manus
H. Length of Ant. Part of Clavicle to End of Pygostyle
I. Length of Femur
J. Length of Tibio-Tarsus
K. Length of Tarsus
L. Length of Middle Toe and Claw.
M. Spread of Foot

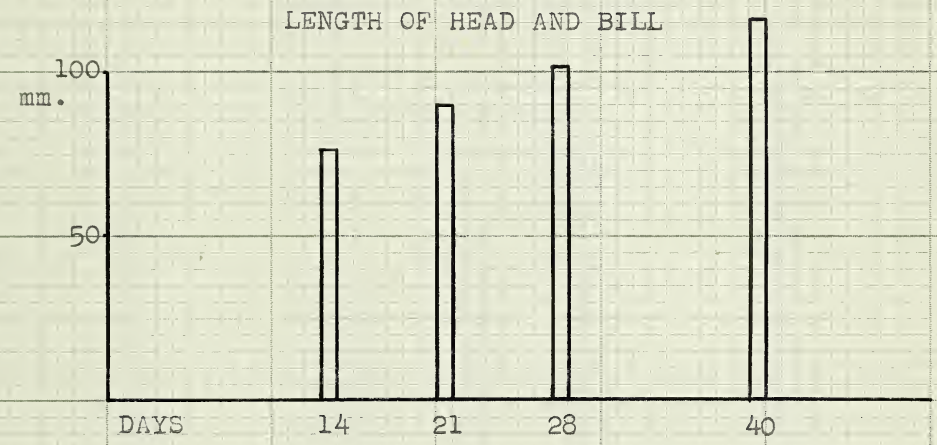
Fig. 31. MEASUREMENTS - Great Gray Owl

Graphs

The following graphs (Fig. 33.-37) summarize the data secured from the young owls during their available period of development. All measurements were taken on live birds and therefore the figures cited will not represent actual bone length but a figure somewhat greater. Fig. 31 indicates how the measurements were taken.

Fig. 32. Great Gray twenty-eight days old being weighed.


mm.
LENGTH OF BILL FROM COMMISSURAL POINT
20
10
DAYS
14
21
28
40


LENGTH OF HEAD AND BILL
100
mm.
50
DAYS
14
21
28
40

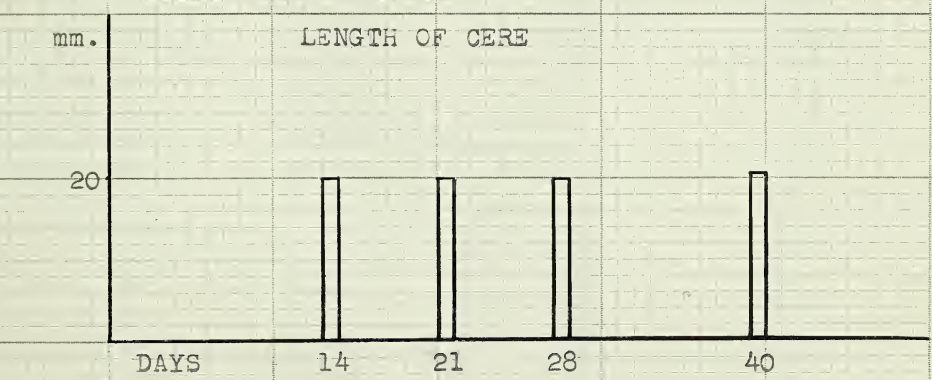
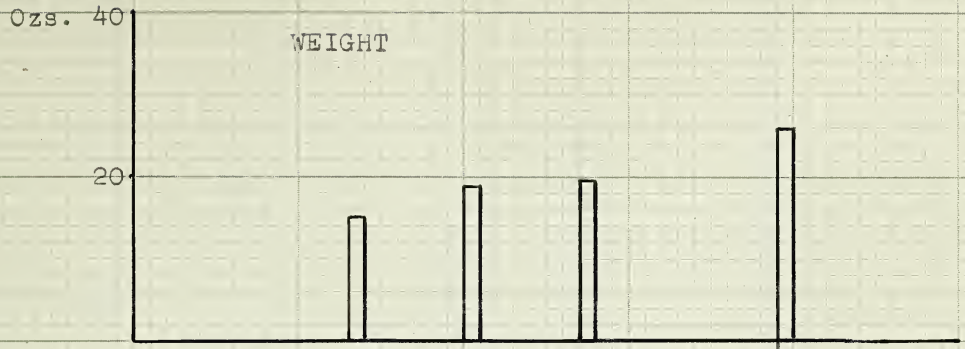
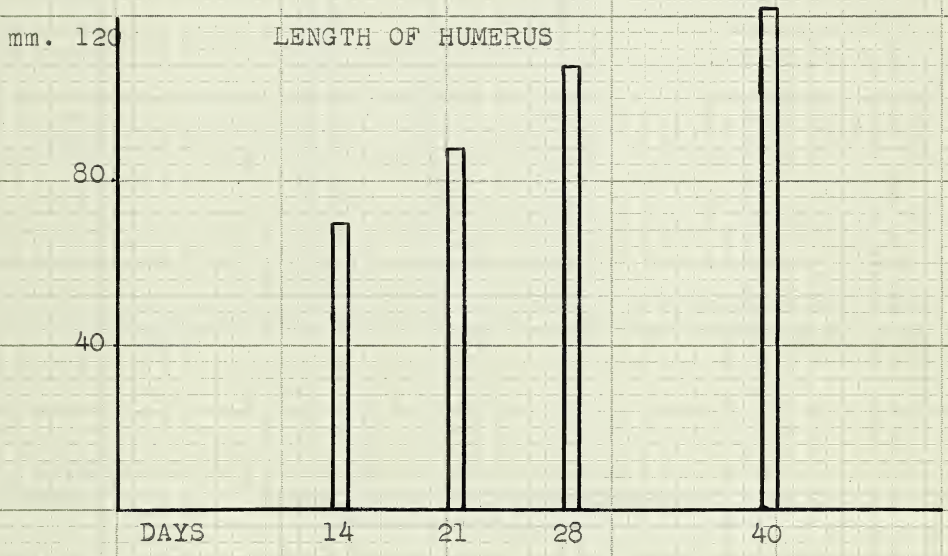

mm.
LENGTH OF CERE
20
DAYS
14
21
28
40

Fig. 33.


Ozs. 40
WEIGHT
20
DAYS
14
21
28
40


mm. 120
LENGTH OF HUMERUS
80
40
DAYS
14
21
28
40

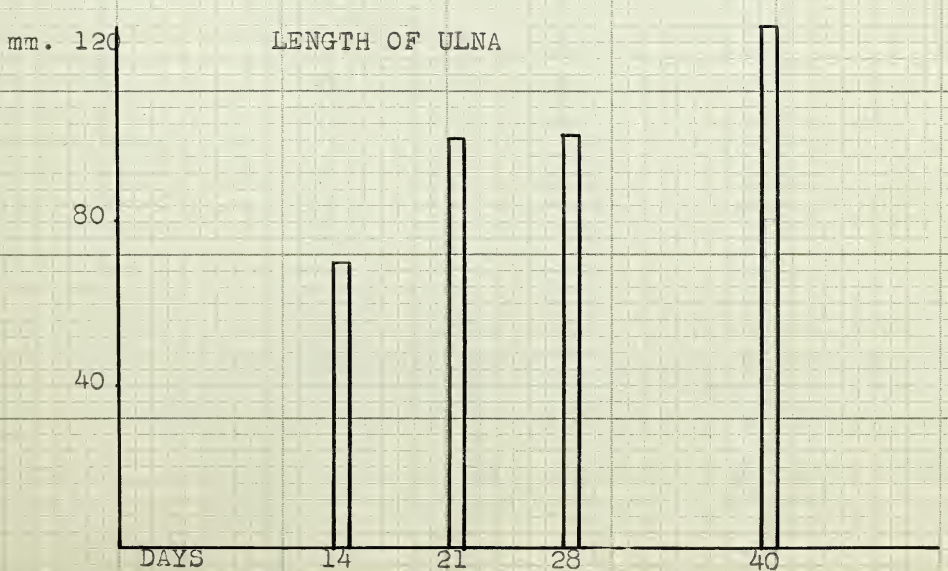
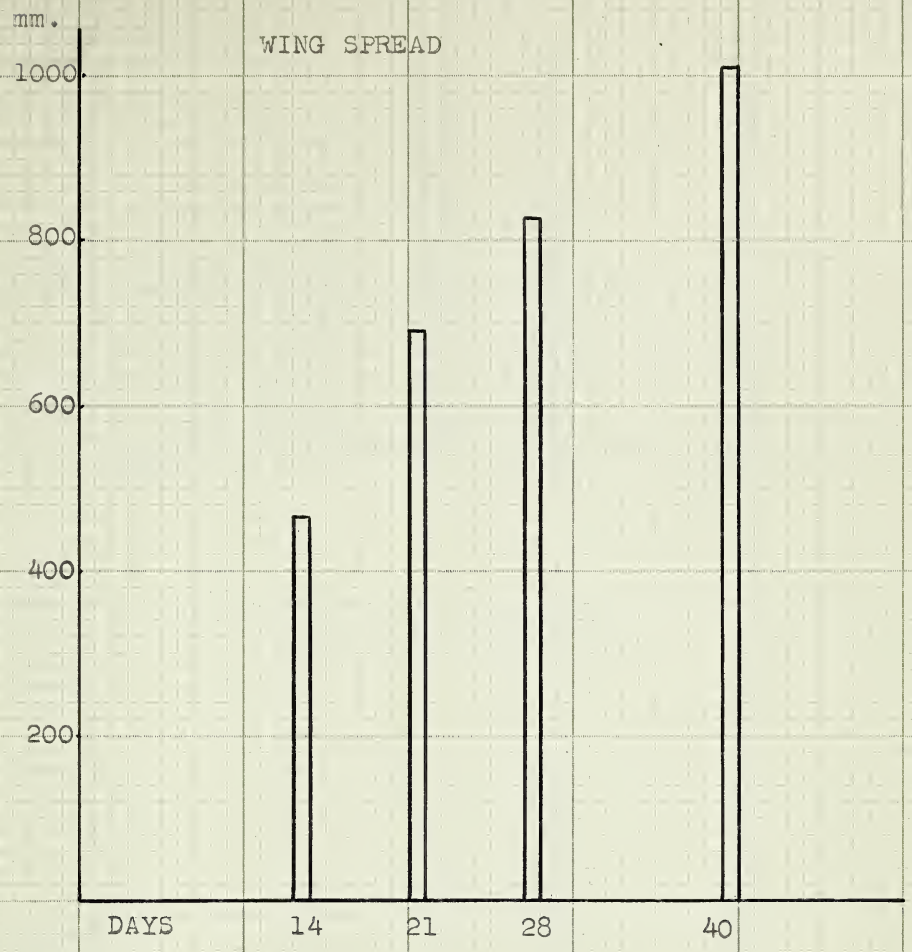

mm. 120
LENGTH OF ULNA
80
40
DAYS
14
21
28
40

Fig.34.


mm.
WING SPREAD
1000
800
600
400
200
DAYS
14
21
28
40

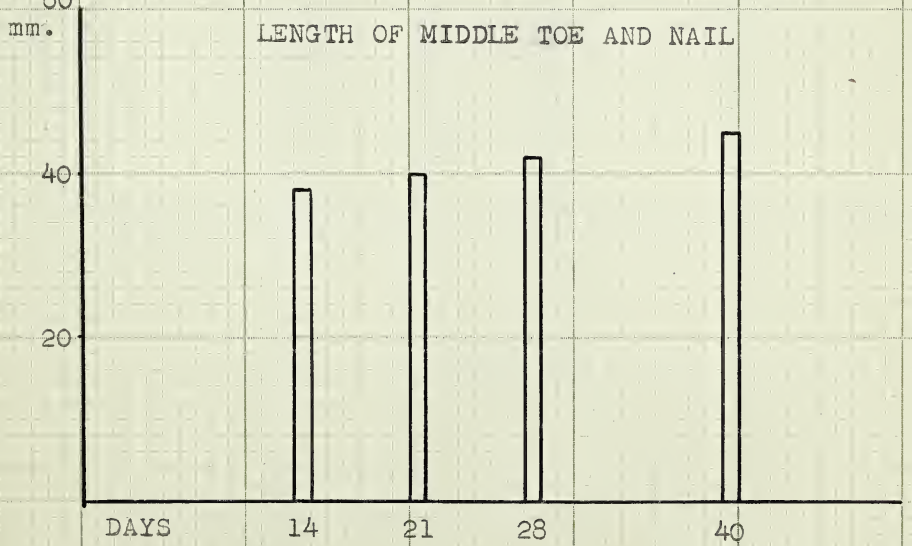

60
mm.
LENGTH OF MIDDLE TOE AND NAIL
40
20
DAYS
14
21
28
40

Fig. 35.


MM.
LENGTH OF TARSUS
50
40
20
DAYS
14
21
28
40

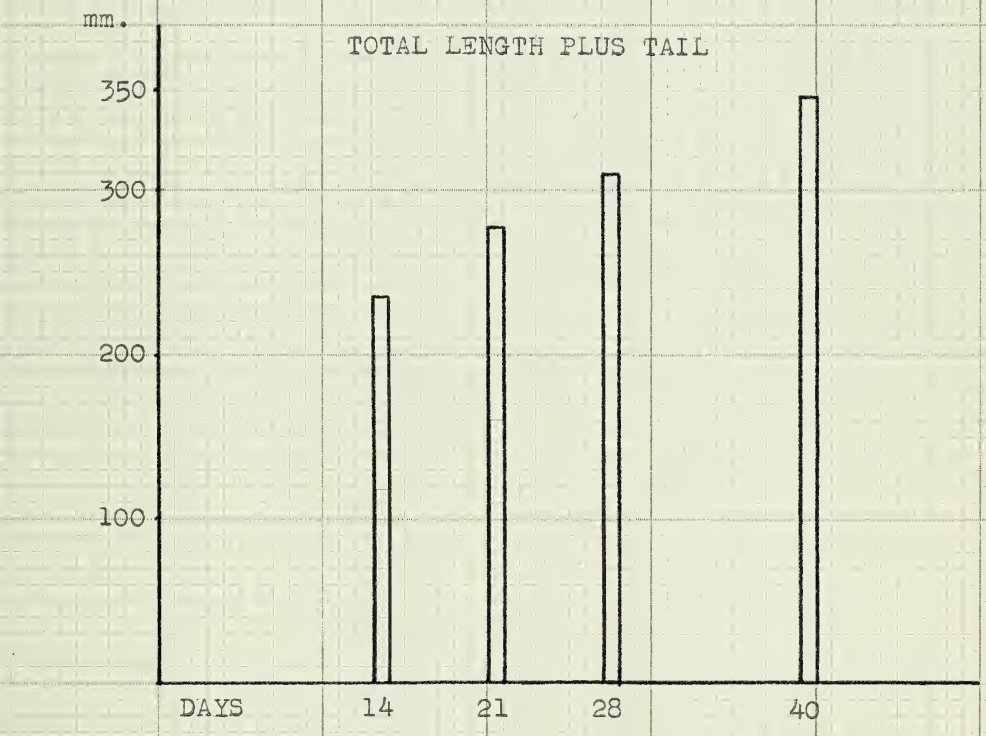
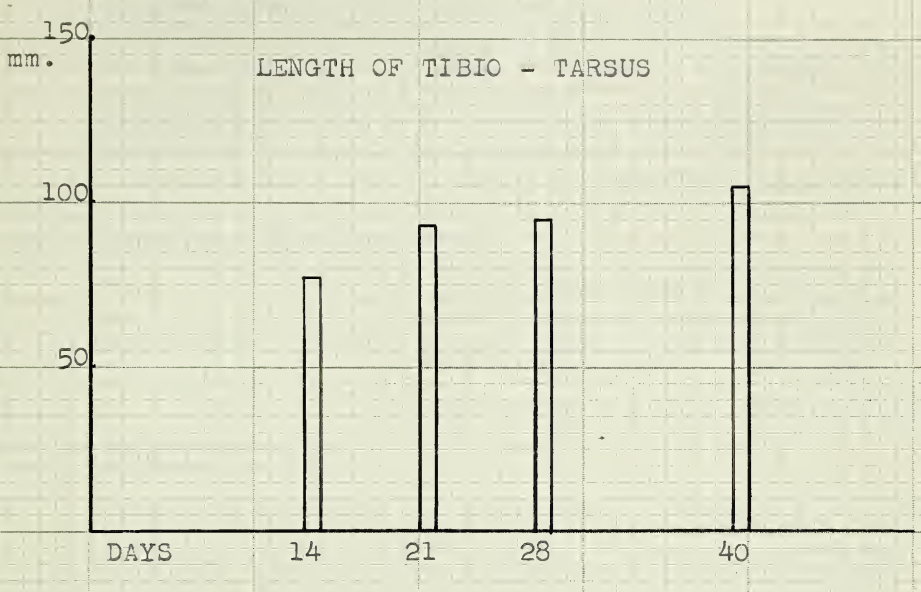

mm.
TOTAL LENGTH PLUS TAIL
350
300
200
100
DAYS
14
21
28
40

Fig. 36.


150
mm.
LENGTH OF TIBIO - TARSUS
100
50
DAYS
14
21
28
40

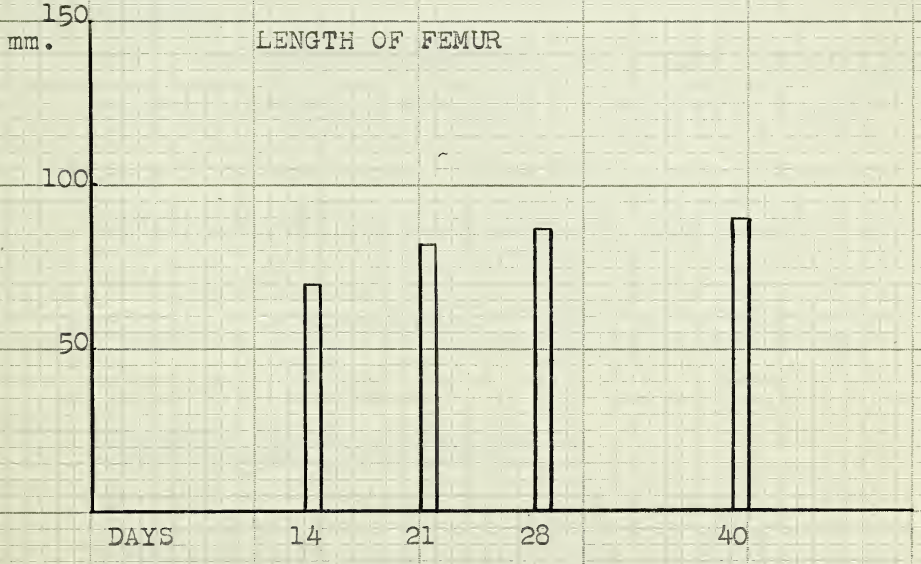

150
mm.
LENGTH OF FEMUR
100
50
DAYS
14
21
28
40

Fig. 37.

Summary

1. Length of Bill From Commissural Point

At fourteen days of age the bill is approximately half grown. There is a gradual increase until at forty days of age the beak is very close to full size.

2. Length of Head and Bill

From a length of 77 mm. at ten days the head and bill grow rapidly, almost attaining full length at 28 days and reaching maximum length at forty days.

3. Length of Cere

From the tenth day on there was no change in length of cere. It measured 20 mm. throughout the study period. The adult measurement averages 23 mm.

4. Weight

After the twenty-eighth day the weight increases from twenty to twenty-six ounces. After the twenty-eighth day the young are moving more, making the first attempts at flapping their wings and muscle development is gradually taking place. The average weight for adult males is thirty-two ounces and forty for females.

5. Length of Humerus and Ulna

At fourteen days the ulna is 70 mm. long and at twenty-one and twenty-eight days it measures 100 mm. On the fortieth day it measured 128 mm. The humerus measured 73 mm. at ten days, and at

twenty-one and twenty-eight it measured 87 and 108 mm. respectively. It is now about 8mm. longer than the ulna but by the fortieth day the ulna exceeds the humerus by 6-7 mm. Meng (1951) found a similar variation in Coopers' Hawks at twenty-eight days.

6. Wing Spread

The greatest period of growth for the wing spread occurs between the fourteenth and twenty-first days with the increase from 430 mm. to 645 mm..

7. Length of Middle Toe and Nail

Very little difference is shown in this measurement from 38 mm. at fourteen days, to 45 mm. at forty days. Adult average is 60 mm..

8. Length of Tarsus, Tibio-tarsus and Femur

The tarsus also shows very little increase from 37 mm. at fourteen days to 50 mm. at forty days. (Adult birds average 60 mm.) The Tibio-tarsus measured 75 mm. at fourteen days and 105 mm. at forty days, the femur 65 and 90 mm.. Adults average 122 mm. for tibio-tarsus and 91 for the femur.

9. Width of Eye

This measurement proved interesting with 8 mm. recorded for the fourteenth day and 14 mm. for the fortieth, which is the adult average.

Behavior Development of Young

At ten days of age the young reach up eagerly for the small pieces of meat the female feeds them. The female holds these pieces lightly in her beak and the young snatch and swallow them.

The nest is kept quite clean since the young, when defecating, will back to the edge of the nest and discharge over the side. At this time they are not in the least aggressive but remain quiet when handled either in or out of the nest. From the twenty-first day on they begin to show increasing signs of aggressiveness (Fig. 38). They are now standing up in the nest and show interest in moving objects about them such as flies. When handled they indulge in beak snapping and clawing. After the twenty-eighth day the young are out of the nest and attempt short flights but seldom more than a few feet. They are surprisingly agile and climb and flap their way up leaning poles and limbs. When they have reached their fortieth day they may be as far as a mile from the nest, making excellent headway with short flights. They are still moving as a family group.

Fig. 38. Great Gray Owl Forty Days old, showing aggressive tendencies.

FOOD HABITS

Introduction

Great Gray Owls like all other members of the Strigidae capitalize on their silent flight and acute sense of hearing and sight. Their flight is not swift and the birds rely on accuracy of location and a noiseless approach rather than speed.

Method of Hunting

This species prefers to hunt in muskeg country. Except at the nesting period when the male hunts by (Fig. 39.) day, these owls are crepuscular. At dusk these birds are seen perched high on old tamarack stubs waiting to make a floating swoop at their prey, invariably mice or voles. The birds have been observed performing a gliding series of flights from stub to stub throughout a muskeg and occasionally stooping to pick up quarry. The flight is soft and measured and appears much slower than that of the Great Horned Owl. Infrequently the birds hunt in the heavy spruce and poplar woods where the method is to sit and wait for some form of prey that will be seen and heard. When perched, the owls assume a face down attitude (Fig. 40.) as if listening and watching for what may move on the ground. They then seem so intent on their task that they can always be approached with ease.

Fig. 39. Male Great Gray hunting in muskeg north of Corbett Creek.

These owls possess none of the pursuit-persistence of the fiercer raptors such as the Great Horned Owl, Goshawk and Snowy Owl. Their disposition is mild at all times and shows no variance in the hunting field.

Prey

Over a four year period a study has been made of the stomach contents from all available specimens collected in Alberta (Table III). Further study was made on pellets collected at the nest under observation (Table V). Identification of all the remains was based mainly on skull characteristics. This work was kindly carried out by Dr. J.E. Moore.

An exhaustive search of the literature reveals only one other listing of stomach contents for this species. It is quoted in Table IV, (Fisher, 1893).

Fig. 40. Close-up, showing characteristic posture of male Great Gray Owl when perched on dead stub in "hunting muskeg".

TABLE III

STOMACH ANALYSES OF GREAT GRAY OWLS

Date	Locality	Sex	Contents			
			Microtus pennsylvanicus (Short-tailed Meadow Vole)	Sorex obscurus (Dusky Shrew)	Clethrionomys gapperi (Red-backed Mouse)	Synaptomys borealis (Northern Bog Lemming)
Feb. 1953	Timeu	Male	3			
Feb. 1954	Saunders	Female	3			
Feb. 1954	Anzac	Male	3	2	1	1
Mar. 1954	Fort Assiniboine	Female	4			
Feb. 1955	"	Female	4		1	
May 1955	Raven	Female	3			

TABLE IV

FISHER'S ANALYSES OF GREAT GRAY OWL STOMACHS

Date	Location	Contents			
		Meadow Mouse	Brewer's Mole	White-footed Mouse	Shrew
Sept. 1889	Carberry, Manitoba				1
Oct. "	Lake Nipissing, Ontario	4			1
Fall "	Elk River, Minn.	3			
Dec. "	Haliburton, Ontario				1 plus Snow bunting
Dec. "	Muskoka, Ontario	3		1	
Jan. 1890	Beavertown, Ontario	5			
Feb. "	Mt. Albert, Ontario	5			
Mar. "	Dover, Maine	1	1		
"	Do.	5			

Bent (1938) records that Dr.W.H. Hall took no less than thirteen skulls and other remains of Arctic Red Polls (Acanthis hornemanni), from the crop of a single bird. Bent also states that Swarth found in the stomach of one an adult Red Squirrel.

TABLE V

PELLET ANALYSES OF GREAT GRAY OWLS

Date	Locality	Contents		
		Microtus pennsylvanicus	Clethrionomys gapperi	Synaptomys borealis
May 9 to June 3/54	Edson	26	4	1
May 9 to June 3/54	Rocky Mt. House	46	1	

Summary

Tables III, IV, and V indicate that this species feeds almost entirely on small mammals. The Northern Bog Lemming (Synaptomys borealis), twice recorded from Great Gray Owl stomach contents and pellets, is rarely taken by Alberta mammal collectors.

Evidence of Spruce and Ruffed grouse feathers near the nests at Edson and Rocky Mountain House suggest that if driven by hunger, these birds can take larger quarry than usual. The fact is significant however, that although Red Squirrels (Tamiasciurus hudsonicus) abounded in both nesting areas, no evidence that they were being preyed upon came to light. Red Squirrels are common throughout the range of the Great Gray Owl,

but the evidence to date lends no support to the constant charge of the trapping fraternity that this species preys habitually on them. It is the argument put forth by most trappers who doubtless have had Red Squirrels at some time torn from their snares (Fig. 41), by owls of the northern forests, that all of the species are guilty of this action. Few trappers are able to accurately identify the culpable species.

Fig. 41. Snared Red Squirrels. Trappers accuse the Great Gray of destroying such catches.

Some sources (Bendire, 1892) maintain that the Snowshoe Hare (Lepus americanus) is the principal quarry of the Great Gray Owl, but no evidence to this effect was uncovered in this study.

ENEMIES

Man

Without question man is the prime destroyer of Great Gray Owls and predatory birds in general. Trappers, poultry-men, and sportsmen are the die-hard enemies of all owls. This species always allows a close approach and presents an easy target to thoughtless people with guns, and as a consequence its numbers have declined to the point where its very existence is threatened.

Pole traps are perhaps the most vicious and deadly set-up that man has devised to kill predatory birds, and owls in particular. A number of pole traps around a pheasant enclosure near Barrhead took a constant toll of owls including such rare species as Richardson's and Great Grays during the winters of 1948 to 1953. Personal investigation of this farm revealed the numbers of raptors taken to be past counting. During the winter of 1952 and part of 1953 a pole trap device near Cross Lake (Figs. 42,43), Alberta was investigated. The toll of birds for that period amounted to 92 Great Horned Owls, three Great Grays and one Barred Owl. The feet were identified and counted by the author.

Black Bears

This species lives in black bear country. Numerous trees containing unused raptors' nests bear the claw marks of black bears, suggesting that they have at some time climbed to the nest either for eggs or young.

Henderson (1923) believes this is a common occurrence when bears smell or hear young birds at the nest.

Fig. 42. Typical Pole Trap Set-up.

Fig. 43. Feet taken from Owls killed in Pole Traps at Cross Lake. (Dark feet are those of Great Gray Owls).

Great Horned Owls

In the Corbett Creek district evidence was uncovered that the Great Gray does fall victim to this powerful bird. A trapper had reported seeing a Horned Owl fly at a bird he thought might be a Great Gray Owl. An inspection of the area revealed a freshly killed Great Gray (Fig. 44) and the remaining evidence was characteristic for the predation of the Great Horned Owl. Otto Borg, a veteran trapper in the Ft. Assiniboine country reports that he saw three instances of this action during the winter of 1954. In years of low Snowshoe Hare populations the Horned Owl is doubtless driven to taking what it can.

Fig. 44. Remains of Great Gray killed by Great Horned Owl in Corbett Creek area.

DIFFERENTIAL WHITE CELL COUNT AND RED CELL COUNTS ON GREAT GRAY OWLS

Three captive birds were submitted to Dr. C. Bigland of the Provincial Veterinary Laboratory in order that a red cell count and a white cell differential could be performed. The birds were identified in this manner.

#1	Male	Very weak and thin
#2	Female	Quite thin and losing both weight and appetite.
#3	Male	Normal and robust

Red Cell Count

#1	Male	1,160,000 per cu. mm.
#2	Female	1,710,000 per cu. mm.
#3	Male	2,010,000 per cu. mm.

The specimens in poorest condition showed the lowest red cell count.

White Cell Differential

	Male #1	Female #2	Male #3
Heterophils	70%	86%	79%
Basophils	1%	2%	6%
Eosinophils	8%	0%	1%
Lymphocytes & Monocytes	21%	12%	14%

A total white cell count is not included as this is most difficult to do in birds because of the existence of nucleated red cells (Sturkie, 1954).

PARASITES AND DISEASES

Parasites

1. Two well preserved specimens of feather lice (Mallophaga) were taken from the body of a bird shot at Anzac, Alberta. Provincial entomologist J.H. Brown kindly forwarded the specimens to Dr. K.C. Emerson, University of Oklahoma, Stillwater, Oklahoma, for identification. His determination was the genus Kurodaia with no species as yet named. Of the several Great Gray Owls examined for this parasite, only the bird from which these specimens were taken possessed any.
2. Seventeen round wormd were taken from the abdominal cavity and the small intestinal tract of a Great Gray Owl shot at Sangudo, Alberta. The round wormd were identified by Dr. L.P.E. Choquette, Institute of Parasitology, Ottawa, as of the genus Porrocoaecum spp. They have been reported from species of owls from many parts of the world. The bird was in poor condition.
3. Blood smears from a deceased captive specimen revealed a number of leukocytozoons. At certain stages in the development of these parasites there is considerable amount of liver damage. This particular bird revealed a much distended gall bladder and numerous

hemorrhages in the liver tissue. A few coliform bacilli, Staphlococcus albus, and an H_2S negative paracolon bacillus were isolated during the post mortem examination of this bird, kindly conducted by Dr. C. Bigland of the Provincial Veterinary Laboratory.

4. While performing a red cell count on a live Great Gray Owl, Dr. Bigland noted that a large number of inclusion bodies could be seen within some of the red blood cells. These were believed to be parasites, either Haemoproteus or an avian form of Plasmodium spp..

Diseases

1. Microscopic examination of the faeces from a bird shot near Sangudo, Alberta, revealed several coccidial oocysts. Coccidiosis is a disease infecting the small intestine caused by the Coccidium sp..

2. Post-mortem examination of a captive bird revealed that death was due to Aspergillosis. This disease is caused by a common fungus, Aspergillus fumigatus. The symptoms are a shortness of breath and a quick heaving of the body, especially the lower part of the abdomen. If the mouth is examined a white cheese-like deposit may be seen. It is interesting to note that almost every Goshawk (Astur atricapillus) kept by the author for falconry, eventually has succumbed to this disease. The fungus is apparently already

active internally at the time of capture. The time for its advance through the bird's internal system varies. This particular owl had been in captivity for a month and was eating well but Dr. Bigland believes the bird had been infected for some time prior to capture. A dose of four grains of phenothiazine for each pound of body weight has met with some success in treating this disease in Goshawks.

ECONOMIC STATUS

Generally the Great Gray Owl remains in wilderness regions where its small mammal eating habits will have no direct effect on agricultural activities. However, its quite evident "mousing" habits would make the birds desirable even in settled farming areas. No substantial evidence has yet been unearthed to convict these birds as Red Squirrel killers. The few game birds such as Ruffed and Spruce Grouse that the owls may take, makes not the slightest difference to the over-all game bird population, especially when considered in the light of the cyclic fluctuations of game bird numbers.

CONCLUSION

The Great Gray Owl is now so rare a species that it deserves protection under all circumstances, regardless of its habits. It is harmless and interesting and much remains to be learned about it. This task becomes

increasingly difficult with the numbers steadily diminishing. The owls still have a vast breeding range left, and only complete protection through enforced legislation will ensure the survival of America's largest but least known owl.

On the basis of the material presented in this study it is evident that this bird is primarily a small mammal feeder, and as such should be encouraged as a beneficial species.

The limited data offered in this investigation would suggest that predation by man is the critical factor endangering the population of this species in the province. Although vulnerable to other forms of predation and disease, the birds do not appear to be seriously threatened by these factors.

It is suggested that only complete protection for all birds of prey, including the common and the rare, will ensure a population of the Great Gray Owl in Alberta.

OBSERVATIONS ON OTHER SPECIES OF OWLS IN ALBERTA

The Barred Owl (Strix varia)

This species has always been considered as an accidental in Alberta. In the course of this investigation enough records of the Barred Owl have emerged to suggest that it is a resident species. Wilk's (personal correspondence) collected records show only four previous occurrences in Alberta. They include a bird collected from Kvass Creek, near Smoky River about 120 miles north of Jasper, on August 9th, 1945 by the Twomey-Mellon party. Preble (1941) heard one near Ft. McMurray, May 1934, the basis for Bent's Ft. McMurray record in his volume on the owls of America. There is a specimen in Cornell University taken at Calgary February 12th, 1912. Barney Hamm of Sexsmith in the Peace River country reports that a neighbor shot a Barred Owl in the fall of 1952. Hamm saw the bird and is familiar with the species.

The following records must now be added to the Alberta list (Fig. 48.)

1. May 11th, 1953. A single feather from the breast of a Barred Owl was found in an area of dense muskeg approximately fifteen miles north-west of Corbett Creek.

2. December 18th, 1953. A dead male Barred Owl was brought to me by Indian trapper John S. Jacobs of Calling Lake. The bird had perished in a weasel set. The mounted specimen is now in my possession (Fig. 46). Weight, measurements and stomach contents were as follows:

Weight	27 ozs.
Length	502.25 mm.
Wing	330.75 mm.
Wing Span	1004.5 mm.
Stomach Contents	3 Red-backed Mice (Clethrionomys gapperi)
	1 Cinereus Shrew (Sorex cinereus)

3. March 27th, 1954. R.E. Junck of Grosmont forwarded a dead female which had been shot by a trapper twenty miles west of Fawcett. The mounted specimen is now in the collection of E.T. Jones, Edmonton. Weights, measurements and stomach contents were as follows:

Weight	26 ozs.
Length	490 mm.
Wing	441. mm.
Wing Span	1053.5 mm.
Stomach Contents	Remains of one Flying Squirrel (Glaucomys sabrinus)

4. March 1954. A pair of Barred Owl feet were discovered in the collection of a pole trapper near Cross Lake, east of Fawcett.

The bird had been taken in a trap set on a pole near a runway housing tame rabbits and pigeons,(Fig.42).

5. April 11th, 1954. While cruising heavy timber country in the search for Great Gray Owls, about 30 miles west of the village of Flatbush, a Barred Owl was observed in heavy black spruce timber along the Akuinui Creek. Mr. E.T. Jones, Edmonton was able to obtain several feet of colored movie film of the bird. Dr.O. Höhn and Mr. William McKay of Edmonton, also observed the bird.

6. April 28th, 1954. The bodies of two dead Barred Owls were seen hanging from the back porch of Mr. Guy Miller's cabin in the Obed Lake area. They had been partly skinned in an amateur attempt at taxidermy. Both skins were secured. One bird was determined to be a female and the mount is now in the collection of W.R. Salt of Edmonton (Fig. 46). Sex determination of the other bird was impossible but a presentable mount is now in the collection of M. Houle of Edmonton (Fig. 46). Both were taken in weasel sets north of Obed Lake.

7. May 15th, 1954. A dead Barred Owl was found in the Saunders area west of Rocky Mountain House (Fig. 45), not less than forty-five feet from the base of a large black poplar containing a nest of Great Gray Owls. The bird was too badly decomposed to enable a sex determination or cause of death.

Fig. 45. Remains of Barred Owl found near site of Great Gray nest at Rocky Mountain House.

Fig. 46. Mounted Barred Owls of specimens collected in Alberta.

8. February 1955. Mr. Helge Carlson, a trapper at Goose Lake, west of Ft. Assiniboine reported catching alive, in a weasel set, an owl with dark eyes and without horns or ear tufts. The owl was taken to Carlson's cabin on the lake and left over-night, in a state of exhaustion, in an open roofed fox pen. The bird had disappeared by morning but feather traces were unmistakably those of a Barred Owl.

9. April, 1955. I received from Mr. Guy Miller at Obed Lake another skin of a recently trapped Barred Owl. The raw skin was sent to Mr. Earl Godfrey of the National Museum, Ottawa, in fulfilment of a request for such material in order that the subspecific status of these birds might be determined. Mr. Godfrey subsequently wrote to inform that the owl was a Northern Barred Owl (Strix varia varia Barton). The skin showed no difference from the northeastern subspecies, and one skin from British Columbia proved to be the same (Godfrey, personal correspondence). The stomach yielded remains of a Snowshoe Hare.

10. May 18th, 1955. A Barred Owl was observed three hundred yards from the very area where the first feather of this species had been found in 1953.

11. May 20th, 1955. The call of this species was heard in the vicinity of the Great Gray nesting site near Edson.

Fig.47. Nest box set out for Barred Owls.

Nest Boxes

In an attempt to produce the first nest of this species for Alberta, a total of twenty-two nest boxes (Fig. 47), were set up in the various areas where the birds had been recorded. Barred Owls have been successfully induced to nest in such boxes in eastern Canada and the United States (Bent, 1938).

The first check revealed no nesting Barred Owls but four had been inhabited by Yellow-shafted Flickers, two by Mountain Bluebirds, three by Red squirrels, one by a Flying squirrel, and four had been torn down by inquisitive

black bears. Five had succumbed to the elements and three remained untenanted and undisturbed.

Conclusion

Reports continue to be received from observant woodsmen who describe an owl answering to the description of this species, from many areas throughout northern Alberta. Many have accurately described its voice, and there is no reason to doubt, especially on the evidence already outlined, that the species has a general distribution throughout northern Alberta. With the advent of more, competent field observers, there is reason to believe a nest will be discovered for the first time in Alberta. Its preference for heavy timber in remote areas has undoubtedly been the major reason for the fact that the bird has hitherto almost totally escaped observation and may yet prove to be a relatively common bird in the province.

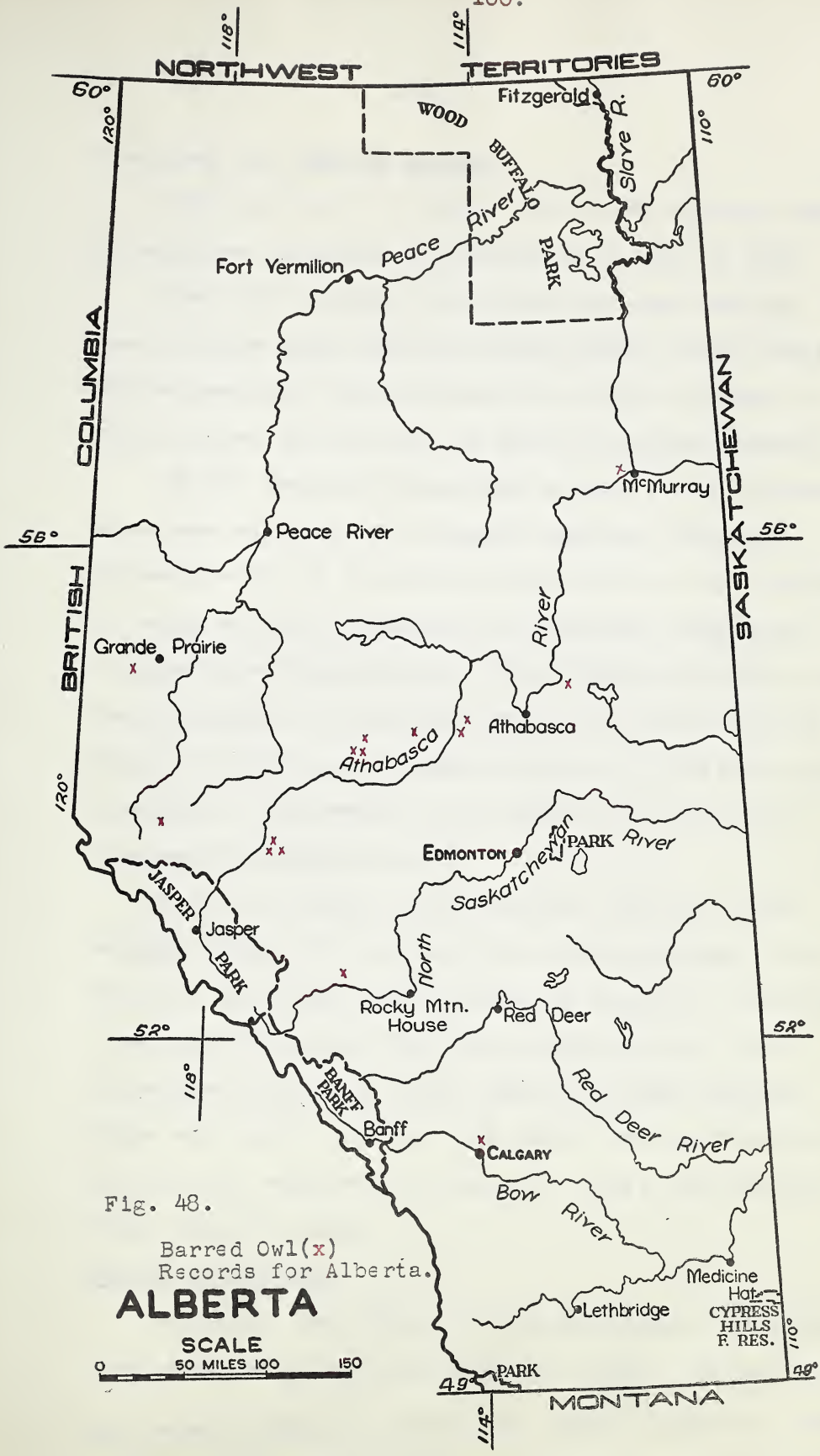
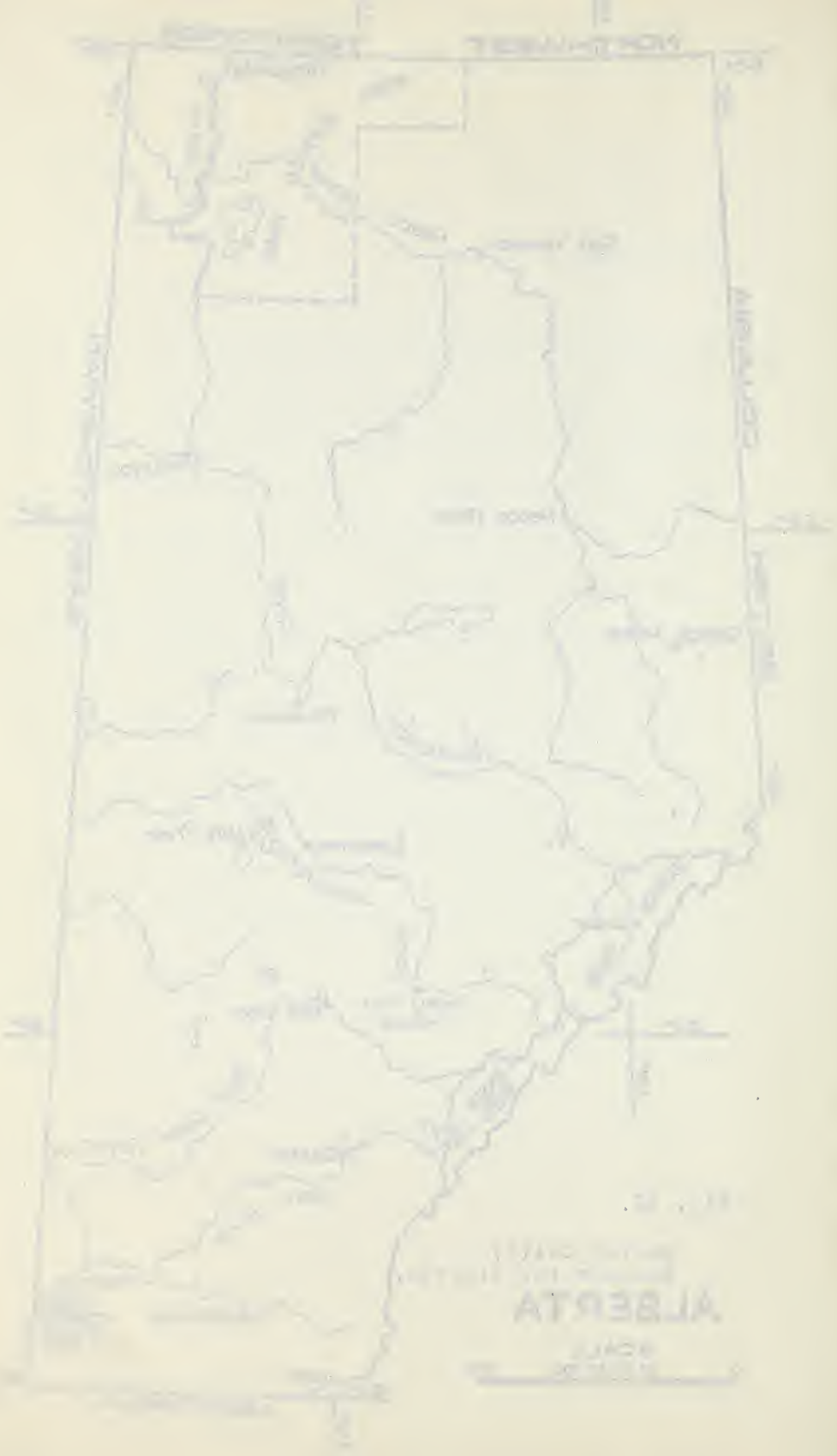


Fig. 48.

Barred Owl(x)
Records for Alberta.

ALBERTA



The Snowy Owl (Nyctea nyctea)

This species is a winter visitor to Alberta, arriving as early as September and remaining as late as May.

The chief concern with Snowy Owls was banding. Very few of these birds have ever been banded during their winter movements and consequently little is known of their routes to and from the Arctic breeding grounds.

In the interest of banding as many birds as possible, none were collected for stomach analyses although a thorough study of the bird's food habits in the province is badly needed to ascertain its economic status and supposed game depredations. Food analyses for this species from castings or pellets are difficult for the reason that fresh or drifting snow makes recovery of sufficient pellets uncertain. Furthermore, the majority of birds are incessantly moving about.

Prior to release after banding, the birds were weighed (Table VI) and the color of the plumage noted. This was an attempt on the basis of weight to corroborate a sex identification long since determined by field collectors from sexed skins; that the light plumaged birds were males, and the dark birds females (Gladden,1936). As with most raptors the female is always considerably larger than the male.

Method of Trapping

A special trap (Fig. 49) was designed, which facilitated capture of the birds without injury. An owl was approached, normally within four hundred yards and while

an assistant set up the trap which was baited with a dead pigeon, a live pigeon was allowed to flutter while attached to a thirty foot cord. When satisfied that the owl had seen the fluttering bird a hasty withdrawal was made with the live pigeon. The owl, if hungry, would fly immediately to the spot and pounce upon the dead pigeon, thus releasing the spring action of the trap and instantly throwing both meshed sides over.

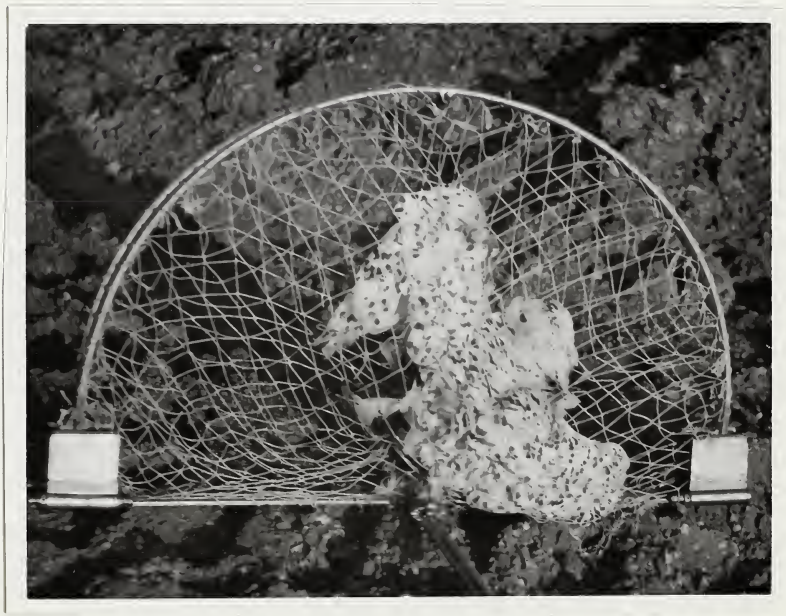


Fig. 49. Snowy Owl caught in specially designed trap.

TABLE VI

SNOWY OWL WEIGHTS AND PLUMAGE COLOR

Specimen No.	Date	Location	Weight Lbs.	Weight Oz.	Plumage Remarks
1.	Jan. 30/54	Big Lake	5	4	Darkly barred
2.	Mar. 3/54	Morinville	3	6	Very white
3.	Mar. 4/54	Morinville	4	10	Very dark
4.	Mar. 4/54	Morinville	5	1	Very dark
5.	Mar. 6/54	Morinville	3	5	Light
6.	Mar. 14/54	Beaumont	4	11	Very dark
7.	Mar. 14/54	Ellerslie	3	15	Quite white
8.	Mar. 14/54	East Edmonton	4	7	Very dark
9.	Mar. 28/54	Morinville	4	6	Darkly barred
10.	Dec. 19/54	Legal	5	6	Dark
11.	Dec. 19/54	Legal	5		Very dark
12.	Dec. 23/54	Calmar	4		Very dark
13.	Dec. 23/54	Black Mud	3	15	Quite Light
14.	Dec. 23/54	Black Mud	4	8	Very dark
15.	Dec. 26/54	Bretona	3	5½	Light, faintly barred
16.	Dec. 26/54	Beaverhill L.	4	15	Dark
17.	Dec. 26/54	Beaverhill L.	3	7	Very light
18.	Dec. 26/54	Beaverhill L.	3	13	Light, faintly barred
19.	Jan. 9/55	Wetaskiwin	4	8	Dark
20.	Jan. 10/55	Morinville	4		Very dark
21.	Jan. 14/55	Tofield	3	12	Light, faintly barred
22.	Jan. 15/55	Raven	3	10	Light, faintly barred
23.	Jan. 15/55	Tuttle	5		Dark
24.	Jan. 29/55	Namao	5	2	Very dark
25.	Jan. 30/55	Namao	4	13	Dark
26.	Feb. 2/55	Josephburg	4	10	Very dark
27.	Feb. 2/55	Ft. Saskatchewan	3	13	Almost pure white
28.	Feb. 2/55	Josephburg	3	8	Quite white
29.	Feb. 6/55	Scotford	4	4	Very dark
30.	Feb. 6/55	Andrew	5	2	Dark
31.	Feb. 15/55	Mundare	3	13	Very white
32.	Feb. 15/55	Mundare	4	10	Dark
33.	Feb. 20/55	Morinville	4	13	Dark
34.	Feb. 20/55	Morinville	4	8	Very dark
35.	Mar. 24/55	East Edmonton	4	15	Dark

Summary

1. Twenty-three birds weighed four pounds or over and averaged four pounds eleven and one half ounces. These were all of dark plumage and considerably darker than the (Fig. 50) twelve remaining birds which weighed under four pounds each. It may thus be assumed on the basis of weight that the birds were females.
2. Twelve birds weighed under four pounds and averaged three pounds ten ounces. These were all of lighter plumage and in three cases (Fig. 51) almost totally white. The weight difference would suggest that these were the male birds.
3. The average weight difference between males and females is 15.8 ounces, with the female the heavier bird.
4. Additional measurements of Snowy Owls were unobtainable due to all work being done in the field. The severity of the weather and the combativeness of the species combined to make the task of taking accurate measurements impossible.

Four Year Cycle of Snowy Owl Movements

In reviewing the literature of Snowy Owl southward movements it is seen that in many instances peak numbers have followed intervals of four to five years or

multiples of that length of time. Gross (1927-31-47) states that this cyclic periodicity is correlated with the established periodic abundance of Arctic Fox (Elton, 1942) and lemmings in the north. Gross recorded peak numbers for Snowy Owls during migration in 1945 and allowing an average of four years for the build-up of another peak this should have occurred in 1949 and again in 1953. This was confirmed from personal observation in northern Alberta for those years. Snowy Owls were exceptionally numerous throughout the winter of 1949-50 and again in the winter of 1953-54, when as many as twenty-eight were observed in one day in the Morinville area.

A congregation of numbers for a return movement has been observed in Alberta. From the middle of March until their departure for the north, these owls gather in certain areas in such numbers as to become up to three times as numerous there as in previous months. The Morinville area north of Edmonton is particularly notable in this respect. An almost daily check of this area during March and April, since 1948, offers evidence that a build-up for a return movement takes place during that period. Gross (1947) suggests the build-up for the return movement as a possibility, and the above observations seem to establish this as a fact.

Fig. 50. Female Snowy Owl showing darker plumage.(Mounted Specimen)

Fig. 51. Male Snowy Owl showing whiter plumage. (From Life)

Banding Recoveries

On January 10, 1955, a female owl wearing band No. 509-02669 was captured in the Morinville area, at a weight of 4 lbs. 10 ozs.. A check of records revealed the bird had been banded exactly one mile from the spot, on March 4, 1954, and the weight was identical.

The Great Horned Owl (Bubo virginianus)

Introduction

This bird is still very common in the province, although its numbers vary noticeably from year to year. Detailed studies have been made on this species in many parts of its North American range (Bent, 1938; Errington,et al, 1946) but no extensive investigations have as yet been made in Alberta. Again a much broader study of food habits is necessary before the controversy over its economic status can be cleared up.

The observations of this species during the present study (1952-55) provided the following information.

Eight nests found in 1952 in the Flatbush district, all contained the remains of Snowshoe Hares. Thirteen nests discovered in 1953 similarly provided exclusively Snowshoe Hare remains. These nests were all in the northern part of the province in heavy timber. Six nests found in 1954 contained a variety of contents. Two were located west of Edmonton and had remains of Pheasants and Ruffed Grouse. White-footed Deer Mice and Short-tailed Meadow Voles were collected from all six. A Pocket Gopher occurred in two others.

This was a "minimum" year for Snowshoe Hares and very few remains were found in any of the nests.

Five nests located in 1955 were all in the Edmonton district, and as is common for this species in low Snowshoe Hare years, the owls were feeding on a variety of quarry. A list of food remains found in or near these nests on a single trip in which all were visited is as follows:

3 Mallard Ducks (Anas platyrhynchos)

3 Coots (Fulica americana)

2 Pheasants (Phasianus colchicus)

1 domestic chicken

Several Short-tailed Meadow Voles (Microtus pennsylvanicus)

2 Pocket gophers (Thomomys talpoides)

2 Short-tailed weasel (Mustela erminea)

In contrast, pellets taken from a single nest in the Flatbush area in 1953 contained parts of the following:

4 Adult Snowshoe Hares (Lepus americanus)

14 immature Snowshoe Hares

1 Red Squirrel (Tamiasciurus hudsonicus)

2 Short-tailed Meadow Voles (Microtus pennsylvanicus)

1 White-footed Deer Mouse (Peromyscus maniculatus)

Stomach Analyses

A report of stomach contents for ten birds examined between 1952-55 is listed in Table VII.

TABLE VII

STOMACH ANALYSES OF GREAT HORNED OWLS

Date	Locality	Sex	Contents		
			Microtus pennsylvanicus (Short-tailed Meadow Vole)	Peromyscus maniculatus (White-footed Mouse)	Miscellaneous
Feb. 1953	Unknown	Male			Wheat kernels and sand
Feb. 1953	Flatbush	Male			Pigeon feathers
Jan. 1954	Morinville	Male		3	Shrew remains
June 1954	Whitecourt	Male	5	1	Rodent remains
Dec. 1954	Edmonton	Male			Shrew remains
Dec. 1954	Edmonton	Female			One complete Red-backed Mouse
Nov. 1954	Edmonton	Female			Pheasant remains
Nov. 1954	Edmonton	Male			Beetle shards
Jan. 1955	Ft. Assiniboine	Female			Snowshoe Hare remains
Feb. 1955	Whitecourt	Male			Red Squirrel remains

Conclusion

The diet of the Great Horned Owl is largely determined by availability depending on its range, the phase of the rabbit cycle, and the abundance of "buffers". Of the ten stomachs examined, six contained mammal remains, two had bird remains and two contained unidentifiable remains. This list is far too limited to permit any definite conclusions as to actual food preferences.

Unlike so many of the other owls, this bird is comparatively wary and appears to be maintaining a substantial population in Alberta.

The Hawk Owl (Surnia ulula)

This species is now extremely rare in Alberta. Thirty years ago the bird was relatively common in all the muskeg areas of Alberta (Henderson, 1919). Its decline since that time has baffled ornithologists (Beebe, personal correspondence). Some lay the blame on failing mouse and vole numbers, while others attribute it to persecution by man. The birds have the same trusting nature of the Great Gray Owls, and doubtless many are wantonly shot. However, the Hawk Owl lacks the conspicuous size of the Great Gray Owl, making it less liable to predation by man. It would seem that some other explanation for the scarcity of this species seems probable.

In 1951 Hawk Owls were again noted in limited numbers in many of the muskeg regions north and west of Edmonton. By 1954 they had virtually disappeared and at the present time are once more scarce throughout Alberta.

The following are records for this species made in the course of this study:

1. April 24th, 1952. A nest containing six eggs was discovered west of Flatbush. E.T.Jones of Edmonton procured considerable color film footage of the birds at the nest and reported that they preyed exclusively on small mammals.
2. July 20th, 1952. Two Hawk Owls were observed in a large muskeg near Chisholm, Alberta.

3. December, 1953. A single male bird was collected in the Rocky Mountain House district by Ranger J. Williams and forwarded to the University of Alberta Zoology Department.

4. February, 1954. A pair were brought to the local taxidermy shop. The birds were shot in muskeg southwest of Grande Prairie and were in breeding condition.

5. March, 1954. A single bird was observed twenty miles north of Ft. Assiniboine on the edge of a large muskeg.

6. January, 1954. A specimen was sent from Whitecourt, having been shot on the outskirts of the village. The stomach contained two Short-tailed Meadow voles.

7. February, 1955. A single bird was again observed in the same location as noted in report No. 5.

8. February, 1955. Another specimen was forwarded to the local taxidermy shop after being shot near the town of Slave Lake.

9. April, 1955. A pair of breeding birds were shot in muskeg country near the village of Wandering River, Alberta, by a local trapper.

Conclusion

The extreme scarcity of this species in Alberta and its habit of preying on small mammals make it a desirable species and worth protecting.

Richardson's Owl (Cryptoglaux funerea richardsoni)

Introduction

This species has never been abundant in Alberta. Henderson (1931) found only four nests, Randall (1929) one, and Rowan (1929) another. In the course of this study five occurrences of this bird were noted as follows:

1. January 1953. A male bird was killed in a pole trap near Barrhead.
2. March 1954. A female was sent from Anzac, Alberta having been shot by an Indian trapper.
3. March 1954. A single specimen was observed in heavy spruce woods north of Spruce Grove, Alberta. It held a partly eaten Redpoll in its claws.
4. April 1955. Another dead female specimen was sent from Anzac.
5. July 1st, 1955. An immature bird was captured near the Tamarack Creek in the Swan Hills. The bird appeared almost blind in the bright sunlight and easily allowed itself to be snared with a nylon noose on the end of a fishing pole. The bird was taken unharmed and thrust into a knapsack but unfortunately escaped. Pellets collected from this specimen contained parts of the following:

   1 Pigmy Shrew (Microsorex hoyi)

   1 Saddle-back Shrew (Sorex arcticus)

   2 Red-backed Mouse (Clethrionomys gapperi)

It is interesting to note that the Pigmy Shrew is rarely collected, particularly in Alberta.

Conclusion

Although the rarity of this species makes its economic influence insignificant, it should be regarded as a beneficial type. Its inability to see well enough to capture food in daylight, and its small size, discount it as a menace to game birds.

The Saw-whet Owl (Cryptoglaux acadia)

No new information on this species can be contributed in this study to the extensive existing knowledge. The bird cannot be considered rare in Alberta but its nocturnal habits and small size make it a difficult species to encounter, much less to study. During the course of this study on owls generally, it was noticed that Saw-whets have been on the increase since 1952.

The following records were obtained from 1952 to 1955:

1. February 1, 1953. A live male was sent from Westlock where it had been captured in a barn. It subsequently died in captivity.
2. March, 1954. A live bird was sent from Stony Plain, having been picked up on a road near the town. This specimen, like most Saw-whets captured alive, ate well but was dead within a week. Rowan says this is

characteristic of Saw-whets that have allowed an easy capture. Post-mortem analysis by Dr. Bigland revealed nothing conclusive.

3. July 1, 1955. A nest containing four eggs was located near Beaumont, Alberta. This is an extremely late nesting date for the species. No detailed study of the nest was undertaken. Four young from the nest are shown in Fig. 52.

Fig. 52. Young Saw-whet Owls.

Conclusion

This species apparently fluctuates in numbers from year to year. It is not known to be migratory. The comparative rarity and diminutive size make it a negligible threat to game. Studies elsewhere (Bent, 1938) indicate that it is predominantly a small mammal feeder and this is apparently also the case in Alberta. The species should be considered beneficial.

The Screech Owl (Otus asio)

Introduction

Only two previous records for the species existed in Alberta prior to this study. These were sight records by A.D. Henderson, the veteran oologist of Belvedere, Alberta (1941, 1955).

The following new records are herewith submitted:

1. October 21, 1954. A live specimen was captured (Fig. 53) in the Swan Hill country north of Ft. Assiniboine. The skin was forwarded to the National Museum for subspecific identification. Mr. Godfrey was unable to name the specimen but felt that an undescribed race might be involved.
2. August, 1955. Dr. Wm. Rowan received another specimen found dead on the highway near Lesser Slave Lake. The bird was a juvenile male, red phase.

Conclusion

With only four authentic records to date, for the species in Alberta, it would be premature to assume that the Screech Owl has established itself in the province. Further investigation with additional records is required before an accurate assessment can be made.

Fig. 53. Screech Owl captured in Swan Hills.

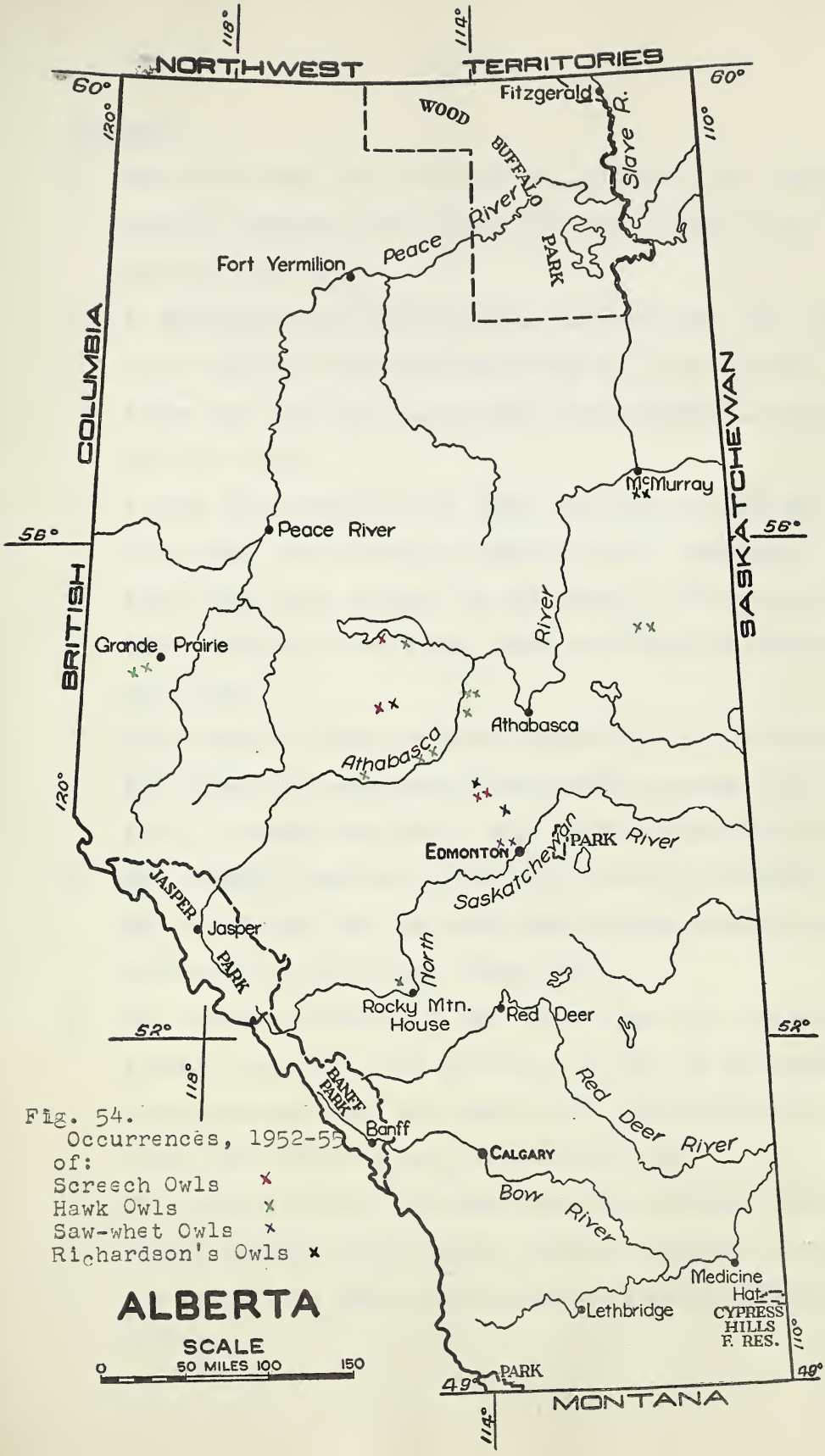


Fig. 54.
Occurrences, 1952-55 of:
Screech Owls ×
Hawk Owls ×
Saw-whet Owls ×
Richardson's Owls ×

SUMMARY:

1. The Great Gray Owl was first described by J.R. Forster from an immature bird collected near Severn River, Ontario, in 1772.
2. A recognized Old World subspecies, the Lapp Owl, differs only slightly from the Great Gray in being lighter in color and with more noticeable longitudinal markings on the breast.
3. A four year study of the Great Gray Owl in Alberta, from 1952 - 55, produced fourteen dead specimens, four live birds shipped to the author, and two nests each containing two young which provided the basis for the study.
4. When compared with the Great Horned Owl it was seen that the Great Gray possessed considerably smaller and weaker feet, a larger head, but a very similar intestinal tract.
5. The sternum, shoulder girdle and correlated muscles of the Great Gray Owl are much smaller than corresponding structures in the Great Horned Owl.
6. The extreme softness of the Great Gray Owl's breast plumage and upper back feathers is due to the length of these feathers and the fewer barbs and barbules as compared with those of the Great Horned Owl.
7. The feather tracts are described. The inferior branch of the ventral tract differs from the typical arrangement for disc-faced owls as described by Nitzsch & Burmeister (1840).

8. The molt observed on a captive bird commenced in late June and the feathers appear to drop in a definite sequence. The Great Gray Owl lacks the fifth secondary and is said to show diastataxy or acquintocubitalism.
9. Great Gray Owls have been recorded nesting from Alaska to the Yosemite Valley of California and east to Northern Quebec and Ontario.
10. Winter movements have been recorded for the species but any regular movements ceased to be noted from 1900 onwards.
11. Three young Great Gray Owls were banded in 1954. Only two previous banding records for this species are recorded in the files of the U.S. Fish and Wildlife Services.
12. There is no information to indicate that Great Gray Owls build their own nests. They prefer to use a structure previously built by some other species of raptor.
13. Great Gray nesting sites are in heavy poplar woods and invariably near an extensive muskeg.
14. The birds become quite vociferous during the nesting season and the male emits a droning noise when rubbing his bill with that of the female during their courtship.
15. An average clutch numbers three and the eggs are laid in late March or April.
16. The birds will assume the defensive attitude and threateningly hunch their backs and call faintly but rapidly when reacting to intruders. They have not been known to attack at the nest.

17. Both adults and young have distinctive calls which are only uttered under certain conditions.

18. The male appears not to share any of the incubation duties but is occupied in obtaining food for the incubating female and later for the young.

19. At twenty-one days the young stand up in the nest and are becoming active. At forty days they have left the nest.

20. In graphing the measurements of young Great Gray Owls, the length of the cere remains almost constant for the first four weeks. All other measurements show a gradual, but variable increase.

21. This species preys principally on small mammals, particularly mice and voles.

22. Man is the chief enemy of the Great Gray Owl. Great Horned Owls will attack and kill the lighter Great Gray Owls.

23. The birds possess a number of parasites including feather lice, round worms, leukocytozoons and malarial protozoa. Coccidiosis and aspergillosis were also discovered in this species.

24. Owing to its scarcity, food habits and general inoffensiveness, the Great Gray Owl merits full protection.

Other Owls

25. Snowy Owls are common winter visitors in Alberta with years of varying numbers. The males are approximately a pound lighter than the females and much whiter in color.

26. Alberta appears to have an established Barred Owl population. Eleven new records for the species, uncovered in this study are evidence of this.

27. The Great Horned Owl's economic status in this province is still open to debate. Its food habits are apparently determined by its range, the availability of quarry, particularly the cyclic phase of Snowshoe Hares.

28. Hawk Owls, Richardson's Owls and Saw-whet Owls offered only very limited opportunities for observation and study in the course of this investigation. It was evident that they are relatively rare birds with the Hawk Owl particularly so.

29. Two new records for the Screech Owl were also added to the Alberta list. Both are the first specimens procured in the Province.

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